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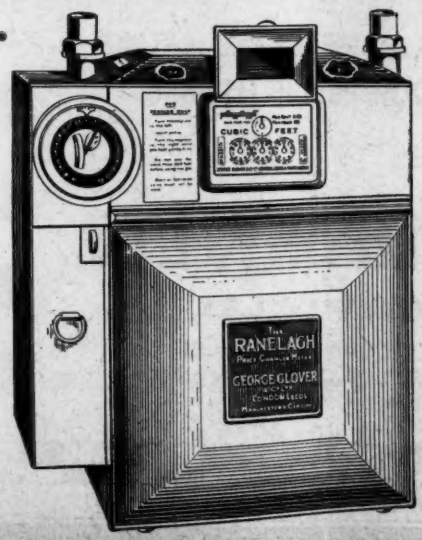

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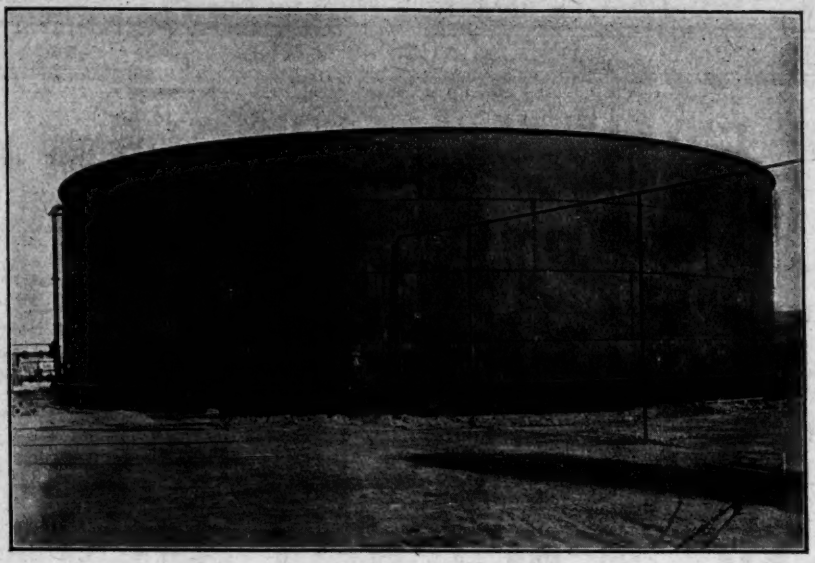

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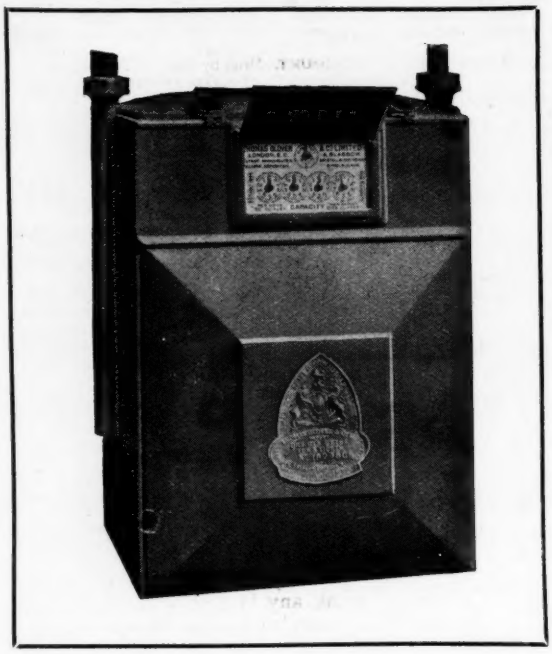

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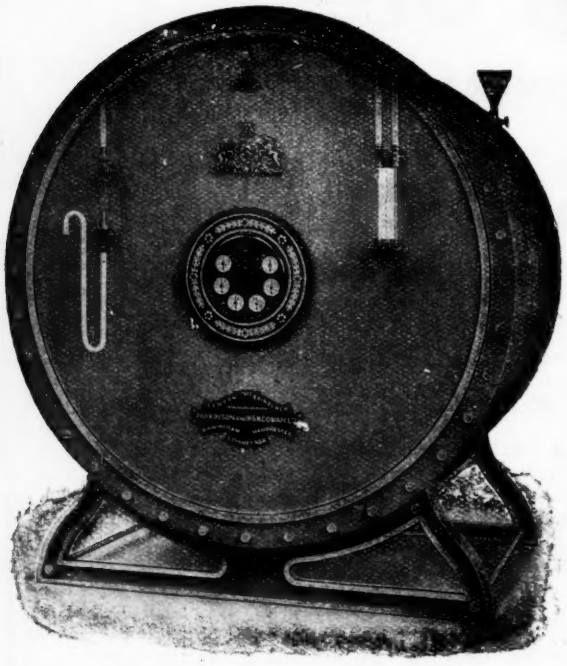

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VOL. CLIX., No. 3091.] WEDNESDAY, AUGUST 9, 1922 [74TH YEAR.

EDITORIAL NOTES.

Gas Bill Complaint—Standard Therm Prices.

THE flood of complaint regarding high gas accounts has increased in the Daily Press during the past week. This applies not only to the London papers, but to some Provincial ones; and the greatest stimulus has been given to it by the papers that, in the "silly season," like to get hold of something that "takes on." Not only has the subject been spread over many columns in the newspapers, but it has found its way into the House of Commons, where before the adjournment questions were asked. There is really nothing very peculiar about all this outcry; but it comes at an unfortunate time, when the gas industry is in a state of transition from bad conditions to better. There have been many waves of complaint in times past. At any time during the last hundred years or so, a similar expression of indignation over gas accounts could have been produced by a little engineering on the part of the newspapers that seek to be highly popular. When all is said and done, with more than 8 million gas consumers in the country, it is not wonderful that sufficient contributors can be found to keep the correspondence columns of the newspapers alive on the subject of high gas bills. If the consumers whose bills were not greater for the past quarter than for the corresponding one of, say, 1920 (1921 being an abnormally high-temperature year) were to write to the papers, there would be such a mass of letters that no notice would be taken of them by the editors. The noisy papers do not like satisfied consumers; they really prefer discontented ones. For this reason, there has been little comment on a statement by Mr. Cyril H. Jacobs, the Vice-Chairman of the Public Control Committee of the London County Council, who has told a newspaper representative that the Council is a large consumer of gas, but they have not had complaints of abnormality in their gas accounts. If the County Council bills had gone up in proportion to those of some of the householders who have written to the papers, they might have had to levy an additional rate to raise the money to pay them. However, if comparison with the June quarter of 1920 showed a 50 to 100 p.ct. increase in the total consumption of gas and the revenue from it, we might have been inclined to share in the feeling that there was something mysterious about the matter. But, so far as we can learn, there has been nothing more than a normal increase in the aggregate consumption and revenue of gas suppliers.

So far as complaint goes among the consumers, various reasons are assigned for the trouble. The therm system of charging is blamed, meters that have been changed are suspect, and the gas is believed to be worse than it ever was before, and so more of it has to be used for performing a given amount of work. There is much more that is mysterious about these reasons than there is in the fact that some gas bills have increased. If the therm system is to blame, then why is it that all consumers' accounts in therm-charged districts have not gone up? Moreover, the past quarter is not the first one of the application of the therm system in many of the areas from which complaints have emanated. While the therm system is blamed in some districts, it cannot be the cause in those areas where the charges are still based on volume—such as in Manchester, Birmingham, and other places, where complaint is also being made. As a matter of fact, nothing can be fairer than the therm system of charging for gas. Then as to the meters, the changing of these has not been universal; and if all meters had been changed, the newcomers would have been meters officially verified and stamped. Again, meters do not all go wrong suddenly, and with one accord. As to the gas being "bad," it is not so "bad" as it was during the war, when people were not making through the Press complaint of high gas bills. When people and newspaper editors say the gas is bad, they are indirectly charging the disinterested official testers of county and urban authorities with being unitedly guilty of misrepresentation in the results of their official tests. The gas suppliers are complying with their legal obligations, or they and the public would hear more of the matter. The allegations really do not bear investigation.

Some of the complaining consumers and certain newspapers have asked for an inquiry by the Board of Trade. But in the House of Commons, Sir W. Mitchell-Thomson, the Parliamentary Secretary to the Board of Trade, stated that they do not think any further inquiry is at present necessary. Nor does anybody else who knows what he is talking about; and yet the gas industry is not averse to one. The Gas Regulation Act provides for the consideration by the Board of Trade of the question of the revision of standard prices on proper representation being made. There is a hint from Mr. Cyril Jacobs that it may be necessary before long for the Board to readjust the standard price of gas in relation to the authorized dividends and the cost of manufacture. Mr. Jacobs appears to be looking well ahead; but he is not irrational, judging from an interview in the "Evening Standard" last Friday. In this he says that the time will have arrived for the Council to apply to the Board of Trade to readjust the standard price "when the "companies are in the position to pay dividends *much in* "*excess* of their pre-war ones." Present information, he adds, would appear to show that two of the large London Companies are paying dividends in excess of their pre-war rates. But Mr. Jacobs realizes the seven lean years through which the companies have passed, when he points out that, under war conditions and after, many gas companies were paying less than the dividends authorized by their statutes. Nothing is said about the heavy losses in the capital values of gas stocks, which have not yet been restored, and will not be until the dividend has better relation with the notions of the investing public. Upon this particular matter, it is said, the London County Council are keeping an eye; and, when they think there is justification for the step, they will immediately make representations to the Board of Trade. This means that, in turn, the National Gas Council will have to keep an eye on the movements of the County Council in this respect.

Meantime, gas prices are falling—not owing to the agitation, but to the better economic conditions under which gas manufacture is being carried on. The little *furore* has naturally stimulated the electricity and oil competitors. We heartily recommend those people who are complaining of heavy gas accounts to utilize, as a cure for their present dissatisfaction, electricity for cooking and heating to the same extent as they burn gas. If they do this, they will be glad enough to return to gas.

An Inquiry Would Not be Opposed.

THE central organizations of the gas industry are not neglecting this newspaper aggravated complaint. The National Gas Council and the British Commercial Gas Association, we ascertained from Mr. F. W. Goodenough the other day, are meeting the matter in what we believe to be the most effective way. In a letter addressed to the "Daily Mail" by the National Gas Council, they point out that to an immediate and impartial inquiry into the therm

system, gas undertakings would offer no opposition. They would, on the contrary, have every reason to welcome an inquiry into their policy and working. Nothing could could have been more politic than this. Had the Council, in the name of the gas industry, demurred to the suggestion of an investigation, it would have aroused suspicion in the minds of those who manifestly do not hold the commercial honesty of the industry in any too high esteem. The prompt willingness displayed to place all cards on the table for inspection and judgment must appeal to most people, and help to carry conviction that the newspaper agitation does not really possess such a solid foundation as is represented. It would have been quite easy for the National Gas Council to reject the inquiry idea in view of the statement, on behalf of the Board of Trade, in the House of Commons that an inquiry is not at present considered necessary, and the obvious opinion of the London County Council that the circumstances have not yet developed in which to press for an investigation. But the gas industry wants a contented public—not such as are having the idea assiduously fostered in their minds that they are being defrauded. A perfectly contented public would perhaps be impossible, in view of the diversity of human idiosyncrasies; but the industry desires to get as near as possible to universal satisfaction in the matter of their business relations with the public. Hence our view that the National Gas Council have taken the right course, in declaring that undertakings would offer no opposition to an inquiry, if officially desired. Of course, it would involve trouble and expense; but if it cleared away doubt and suspicion, and engendered a better understanding of the therm system, it would be worth all that was expended upon it. We publish the letter of the National Gas Council on p. 314; and it would be a good thing if the letter were printed in every important newspaper in the country. We believe a copy of it will find its way into the hands of the editors of the principal newspapers throughout the country, through the agency of the British Commercial Gas Association. In view of this, in view of the possibility of the present agitation resulting in a general inquiry, perhaps it will be well for the managements of gas undertakings not to deal locally and separately with correspondence; but to leave the matter for general treatment (if need be) in the hands of the central organizations, to whose lot would fall representation of the industry, should an inquiry be held.

High-Temperature Carbonization, with a Free-Burning Smokeless Fuel.

ONE of the most notable essays at improving carbonizing practices has been made by Messrs. E. R. Sutcliffe and Edgar C. Evans; and they have given an account of the "discovery" they effected ("discovery" is quite an appropriate expression) to the technical world through a paper before the South Wales Institute of Engineers. Their scheme is revolutionary; but this is no reason for pushing it aside, and not giving to it adequate consideration, though naturally one will be desirous of seeing actual data from a working-scale plant, because it is quite evident that the basis of much in the paper is from experimental working. The authors, however, speak with good assurance and definiteness. The curiosity of gas engineers can be sharpened at once by the authors' statement that a high-grade smokeless fuel can be made in any existing carbonizing system, at any temperature of carbonization that it is desirable to use, and at a cost which makes the process a commercial proposition. This means that every high-temperature gas-retort or coke-oven plant in the country can become a centre, if required, for the production of a solid smokeless fuel. But there is a further remarkable feature—that in the process finally adopted by the authors they decided to carbonize at temperatures running up to the highest known in practice, and so have in the result a fuel containing as little volatile matter as possible, and yet a fuel free-burning and comparatively easy to ignite. There we have at once a scheme that aims at destroying all the theories on which low-temperature development has been taking place. For the gas engineer, there are two particularly noticeable features in this process: First, that it does not invite them to abandon high temperatures; secondly, that the leaving of "as little volatile matter as possible" in the coke, would enable them to maintain inviolate the first principle in their professional formulary to make as many therms as possible in the shape of gas from the coal they use, subject always to the market values realizable for secondary products. The "leaving of as little volatile "matter as possible" in the coke, and that coke yet being free-burning and easy to ignite, are both ruthlessly destructive of preconceived notions. They point to the fact that there are physical characteristics that supply compensation for the volatile matter, which has always been regarded as the essential for improving the quality of gas coke for domestic purposes.

It is hardly necessary to say in view of this that Messrs. Sutcliffe and Evans discard absolutely all existing low-temperature processes for the production of solid smokeless fuel. They are out to get the maximum product from the raw material they use, and, notwithstanding, realize the same end in respect of a domestic fuel of highly attractive qualities. They also dismiss all mechanical operation for carrying coal through the retorts, preferring to rely upon that simplest and cheapest method of doing it—gravity. Perhaps it should be said here that we are not by any means accepting, at this stage, as finally and commercially proved, all the claims that are made in the paper. We, as will be the case with our readers, know nothing more than is presented in what has been published by the authors themselves. But they make out a case on their experimental research and experience for very careful technical consideration. Certain it is that, if the case stands the test of working on a large scale, then low-temperature carbonization will find itself faced with difficulties of a more insuperable character even than those that are known to confront it already. However, this by the way. Messrs. Sutcliffe and Evans are out, as we were saying, to get the maximum product from the raw material used, with at the same time a free-burning smokeless fuel, having a volatile content as low as possible. Of course, the quantity of the gaseous and liquid products produced per ton must vary with the chemical and physical characteristics of the raw materials; and one would imagine that the physical features of the coke, and therefore its burning property, would also differ accordingly. But there seems in the paper to be a lack of information on this point. Whatever the constitution of the material used for carbonization, the one claim is made as to the free-burning and easily ignitable characteristics of the resulting coke.

Briefly put, the author's process is preliminary briquetting of the raw material, and carbonizing in internally heated retorts. The two things go together, and the one appears to be essential to the other in realizing the results already indicated. As to internal heating, most authorities are becoming persuaded that thermal efficiency in carbonization lies in this direction, and many of them are also becoming convinced that it offers the quickest and most effective method of carbonization. But we have to consider it specially in relation to this process; and pre-briquetting of the material is the means found by Messrs. Sutcliffe and Evans to serve the end of obtaining maximum effectiveness in carbonizing, having regard to the physical characteristics of the coke. From the paper it would appear that most kinds of coal lend themselves to the treatment. If this is so, then, of course, there is a highly valuable economic advantage in being able to purchase from a larger range. Most coking coals, we are told in the paper, briquetted with 25 p.ct. of breeze without a binder, and subsequently carbonized, will give an excellent smokeless fuel. Again, many coals, which are generally regarded as non-caking, produce, it is said, an excellent coke if preliminary briquetting is resorted to. The point as to the utilization of so much breeze with coking coals, gives visions of a more profitable use for low-priced breeze—"low priced" considering its calorific value. But, on the other hand, breeze in re-carbonizing takes up space in the retorts, and is not gas-yielding. Coals of the non-caking variety, too, are mostly poor in their gaseous and liquid yields per ton. But if the process is going to enable a larger throughput per given unit of carbonizing capacity by pre-briquetting and internal heating and employing a superheated coal gas (which is another feature of the process), and if the over-all costs per ton are below what generally results from present carbonizing practice, then there will be good compensation to any reduced production per ton by making use of the lower qualities of coals, even those of the non-caking variety.

In the briquetting process, the coal is first washed. It is then ground to a size determined by the qualities required in the resulting coke; the finer the grinding, the more free burning the resulting fuel. The coal is then mixed with

coke breeze, non-caking coal, or pre-heated coal in suitable proportions. The mixture is briquetted in a high-pressure ovoid press without a binder. Ovoid briquettes, it is said, will pass through the retorts without fracture; and they retain their shape. In some comparative burning tests, the authors found that 12 lbs. of gas coke took four hours to burn, and left unburnt cinders to the amount of 2 lbs. 15 oz.; while a similar weight of pure coal briquette coke took seven-and-a-half hours to burn, and there was only 5 oz. of residue, which speaks highly for the efficiency of the coal-washing part of the preliminary treatment. The form of the briquettes lends itself to rapid carbonization, because the superheated coal gas is thereby conveyed at once to all portions of the charge, and uniform carbonization is thus realized. In this way, Messrs. Sutcliffe and Evans submit that they obtain all the advantages of high-temperature carbonization, and in addition (since the coal is gradually heated to its maximum), the tars, light oils, and light spirits are expelled at low temperatures, and are equal in quantity and characteristics to those realized by low-temperature working. As to the carbonizing period, the authors in their experimental work have carbonized coal in two hours; and they describe as being within easy reach of possibility a carbonizing period of eight to twelve hours in a retort 12 to 14 ft. in diameter. Internal heating lends itself much better than external heating to large-scale carbonization, in view of the uniformity of heating.

An important point is cost; and there will no doubt be a disposition to take with some reserve the figures given by the enthusiastic workers. The cost of the preliminary treatment is put at 2s. 6d. to 3s. 6d. per ton—that is, from the coal-washing to the briquette pressing. Carbonizing costs are calculated, on a plant of 250 tons capacity per day, at only 5s. per ton—together 8s. 6d. The 5s. is made up of 1s. labour costs; 2s. 6d. capital charges, at 10 p.ct.; and wear and tear, power, water, steam, stores, &c., 1s. 6d. The total figure compares very favourably with present costs per ton in gas-works. But the gas-works figures are from day-by-day practical working; those for the new process have only been calculated from experimental operation. There is the case, however. It is in every part attractive; but it lacks the corroboration of large-scale working. It ought not to be long before it obtains this, because the outlined advantages (which, to say the least, are striking) considerably outweigh the submitted costs of preliminary treatment. Anyway, we hope to hear of trial being made under ordinary working conditions; and then we shall await with interest the ascertained results.

An Engineering Joint Council.

The Institution of Civil Engineers have issued a circular which announces proposals for a closer co-operation among the leading engineering institutions. The matter has recently been under consideration, and has received the approval of representatives of the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, and the Institution of Electrical Engineers. As a result, an Engineering Joint Council composed of representatives of these bodies has been formed. This is interesting; but a point of equal interest is that the Institution of Gas Engineers does not appear from the circular to have taken part in the conference, nor at present to have representation on the Joint Council. It should, however, be said that it is anticipated that at a later stage the number of bodies represented on the Joint Council may be increased; but this is a matter for the future consideration of the Joint Council and the Institutions concerned. The objects in view are legitimate, and altogether proper. They are to improve the status of engineers, to secure the better utilization of their services in the country's interests and the appointment of properly qualified individuals to responsible engineering positions, and to prevent the unnecessary duplication of activities. All these objects are commendable—particularly if the improving of status carries with it proper reward. Another point is as to how determination is to be made that those appointed to responsible engineering positions are "properly qualified." Is it to be by examination, work done, or is membership of the Institution of Civil Engineers to suffice in attesting proper qualification? These are matters upon which further information is desirable before accepting the objects without reserve, though in themselves highly commendable. The Joint Council ought to be the means of raising the efficiency of the technical organizations of the country; and in the prevention of unnecessary duplication of activities, there should be economy and an augmentation of efficiency.

Utilizing the Blow Gases of Water-Gas Plant for Retort Heating.

An interesting communication has been received from Mr. James Lowe, of Auckland (N.Z.), describing his twin-generator plant for making blue water gas and producer gas, and its operation. The plant is arranged so that water gas is made in one generator while the fire in the other is being blown up or revivified with air—equal blue water-gas making and producer-gas making alternating in each generator, so that a continuous production of water gas and producer gas is maintained. It appears that Mr. Lowe has had a double purpose in designing this plant, which can be used with any type of retort-house settings. The first is to raise the therm production in the form of gas per ton of coal handled, and the second is to increase the over-all efficiency of the gas-making process by utilizing "all the "coke consumed during the blow as producer gas in heat-"ing the retorts." The producer gas does not entirely displace the usual furnaces for heating the retorts, but is an auxiliary heating agent which reduces the amount of coke consumed in the furnaces. It is pointed out by Mr. Lowe that the plant could, if desired, be installed with a capacity sufficient to enable complete carbonization to be effected. But his preference inclines to something less than that—say, a make of 25,000 c.ft. of gas per ton, having a calorific value of 450 B.Th.U. per cubic foot, with a residue of approximately 6 cwt. of coke per ton for sale with the class of coal he uses.

There will be (and this Mr. Lowe wants) some critical examination of the claims—particularly of the one that the plant makes blue water gas with an efficiency of 90 p.ct. It is explained in the statement as to the advantages of the system that the plant has that efficiency, because all coke consumed during the blow is utilized as producer gas in heating the retorts. In arriving at this efficiency, Mr. Lowe neglects the power to drive the blower (this being, in his opinion, not a factor in the thermal efficiency, but an operating cost). He takes into account the total heat of the steam used, but not the fuel in the boilers to produce the steam. His method of arriving at the efficiency of the plant will doubtless be criticized. The efficiency of a blue water-gas plant, taking into account the steam required for its operation, is (as the Gas Investigation Committee report) about 46 p.ct., which would be increased to 56 p.ct. were a waste-heat boiler utilized. Assuming Mr. Lowe's efficiency to be correct, he practically doubles the 46 p.ct. by utilizing the blow gas for heating retort-settings. Of course, the blow gases of water-gas plants have been utilized for various purposes, especially in Germany. Upon the subject of blow-gas utilization, Mr. Harald Nielsen was writing in our columns on Feb. 1 last—his advocacy being in favour of obtaining a blow gas of greater heating value by reducing to some extent the make of water gas. This is the line upon which Mr. Lowe has been proceeding, as was shown by correspondence in the "Journal" for May 24 last. The main point in his aims, however, is to produce an over-all higher efficiency in the combined plant—water gas and coal gas. It will be observed from the data he supplies that in an eighteen-day run, through this method of utilizing the blow gases for assisting in heating the retorts, 24½ tons of coke was saved in the retort furnaces. In this trial Mr. Lowe was not working up to his objective—the making of 25,000 c.ft. of 450 B.Th.U. gas. But possibly he will be doing this later, as he is installing the plant in conjunction with a new system of intermittent vertical retorts. Then the tops of the generators will be on a level with the top of the retort-bench; and they will be fed with coke in the same manner as the producers. In his working at the present time, it would seem that some of the sensible heat of the water gas is lost; but when this gas is passed hot into the vertical retorts, practically all except radiation and ash-pit losses will be recovered.

In view of the working at the moment not being on the lines which will give maximum results, the data supplied in the article elsewhere can only be taken as indicative of what is accomplished in present circumstances. Before adopting the water-gas plant, from the coal Mr. Lowe carbonizes he was obtaining 12,767 c.ft. of 578 B.Th.U. gas, or 73·8 therms per ton. With the blue water gas (which is of

exceptionally good quality—325 B.Th.U. per cubic foot), he is realizing 16,290 c.ft. of 526 B.Th.U., or 85·6 therms. With his objective of 25,000 c.ft. of 450 B.Th.U. gas, 112·5 therms would be realized. The contribution is full of interest; but the utilization of the blow gases for heating the retort-settings is the matter that is supremely so.

The Parliamentary Session.

Both Houses of Parliament have adjourned until Nov. 14; but should the public interests demand it, there will be an earlier reassembling. The session has not been a particularly lively one for gas legislation. There were few Private Bills affecting gas, in view of the fact that so much is now being done through the Board of Trade under the Gas Regulation Act. In connection, however, with Special Orders issued under section 10, there has been a larger opening made for opposition when the Orders are presented to the Houses of Parliament for their ratification. There is also some talk as to an investigation of the basic price principle in relation to dividends. The Chester, Sheffield, and Windsor Gas Bills have gone through—modified more or less by agreement or in their journeying through the Houses. In the case of the Windsor Gas Bill, the question of the basic price was referred to the Board of Trade by the Unopposed Bills Committee. The Stretford Joint Board Bill has gone through; so that the Manchester Corporation are to lose that newly acquired part of their concern. The Stoke-on-Trent Corporation Bill has not only passed, but the Potteries Station (under agreed terms) has already been transferred from the possession of the British Gas Light Company. The Electricity Supply Bill received the Royal Assent last week; so now some people are happy in the electricity supply industry—others are not.

Gas Coal Position.

The American demand for coal has been a godsend to Durham and South Wales, and the purchasing in Durham has been largely of the better classes of gas coals. Orders for transatlantic use have also penetrated into other of the mining areas. A result of this is that stocks at collieries have been much reduced—particularly of the better-class varieties. Continental buying shows a little shrinkage, owing to the somewhat higher prices which the American demand has allowed the coalowners to command. Home industrial buying is still light; but the household and gas coal markets are looking forward to a brightening-up shortly, in view of the rapidly approaching autumn and winter. The prices of best-class gas coals in the Durham and Northumberland areas show a rise on some recent figures of from 6d. to 1s. 6d. per ton; and quotations for second grades have followed suit. But last week, for the latter classes, there were buyers who succeeded in booking-up their requirements at something like 1s. below the quoted figures. The higher prices are causing some would-be purchasers to hesitate. Those who have held-off from making contracts have (some people seem to think) lost the lowest point in the market—at any rate, for this year—inasmuch as there is a combination of circumstances now in favour of the collieries especially the more northern ones. A greater export demand stocks low, and winter's swelling demand coming nearer, are conditions which place them in a good position prospectively. It is true that in Yorkshire there is active competition for business on offer from gas undertakings. In that area, screened coals can be secured from many pits. This indicates a present light demand in that area; but there is an expectation of more activity, for stocking purposes, in preparation for the winter season.

Sound Advice to Investors.

The "Financial Times" has been discussing the price of the Gas Light and Coke Company's ordinary stock, and its prospects. The price fell a couple of points one day last week; and our financial contemporary attributed this to the Press attacks in relation to so-called high gas accounts—a matter discussed in an editorial article to-day. It says that holders of stock will be ill-advised to be scared by a "stunt" campaign. The investor who has locked-up his savings in sound securities should not allow himself to be frightened out of them by Press scares. In this connection, the "Financial Times" reminds its readers that "we are approaching the seasonal period peculiar to the sea-serpent; and the present attack on the gas companies would appear to be the harbinger of other *bonnes bouches* to follow." The reduction of the Company's charge for gas to 11d. per therm will make the authorized rate of the next dividend £6 10s. 8d. p.ct.; so that, at the present price of about 94, the stock can be regarded as a first-class investment to yield about 7 p.ct.

Household Coal and Gas Fuel.

Last week there was a general rise of 2s. per ton in the price of coal, and the probability is there will be a further increase before the winter. Gas prices are falling; so that the strongest competitor that gas has for heating purposes is augmenting the advantages of gas in the matter of adoption for household use. The Coalowners' Alliance give the prices of coal as follows: Best household, 55s.; Silkstone, 45s.; Derby brights, 44s.; kitchen coal, 43s.; house nuts and best cobbles, 42s.; hard cobbles and kitchen nuts, 39s.; and stove coal, 35s. Supposing a Silkstone coal at 45s. per ton, and with a potential heating value of 29,000,000 B.Th.U., and assuming the use of this heat energy at 20 p.ct. efficiency, this would give 5,800,000 B.Th.U. usefully applied. Taking gas at 11d. per therm, 45s. would purchase 49 therms, or 4,900,000 B.Th.U. This, used for heating at 75 p.ct. efficiency, would give 3 675,000 B.Th.U. usefully applied. The 55s. per ton paid for best household coal would allow 60 therms in the form of gas to be purchased, or 6,000,000 B.Th.U. This, used at 75 p.ct. efficiency, would give 4,500,000 B.Th.U. usefully applied. These figures are bringing the coal and gas competitors into close accord economically, seeing that there is considerable loss from coal fires through having to maintain them when not actually required, while gas can be lighted and extinguished just as heat is needed. It is a great advantage on the side of gas to have no stand-by charges. Domestic economy is further aided by the considerable saving in labour and dirt when gas is the fuel instead of coal.

Oil Fuel Price and Application.

With the reductions during the past twelve months in the prices of coal and coke for steam-raising, fuel oil (which was adopted somewhat extensively during the coal strike last year) fell into disfavour. Steam-raising, with all the advantages of oil, was relatively dearer by it than by coal. The resulting loss of business stirred up the oil people; and there was a cut in their quotations. According to the "Petroleum Times," this cut has given a greater impetus to the application of oil fuel; and it says there is no doubt that for a variety of purposes it is steadily displacing coal. Standard grades of heavy furnace oil, it is stated, can now be purchased at coast installations at about £3 per ton, while standard grade Diesel fuel can be bought at about £4. This is a decline of something like 50 p.ct. on the figures ruling twelve months ago. The importing companies are now willing to make contracts for considerable periods ahead. Therefore (remarks our contemporary), it is no surprise to find that oil fuel is making further inroads into the domain which until recently was the monopoly of coal.

Tar and Fishing Waters.

A complaint has been made in the daily papers by Mr. W. H. Berry regarding the non-publication of the evidence on which the Joint Fisheries Transport Committee (who spent nearly three years in experimenting upon the influence on stream life of rain washings from tarred roads) based their far-reaching conclusion. This was that tarred roads gave off poisonous substances under conditions difficult to control, and that therefore tar should be avoided in favour of bitumen in the neighbourhood of fishing waters. Inquiries at the Ministry of Transport have elicited that the Committee in question has been disbanded. The Ministry of Agriculture, on the other hand, has set-up a Sub-Committee of its Standing Committee on Rivers and Pollution, whose duty is to examine and report on all forms of road dressings. From this it appears that there is no authority charged with the duty of publishing the evidence which resulted in the finding of the Joint Committee. This, Mr. Berry says, is a matter of public concern; and producers of tar, as well as makers of bituminous road materials, must make it clear that the whole of the facts which have been collected to warrant the condemnation of the first class of material in favour of the second must be published, so that the extent of the risks run in either case can be gauged.

Industrial Disputes.

There has been an inquiry in the House of Commons as to the working days lost through industrial disputes in this country for each year since the Armistice. According to Dr. Macnamara, the aggregate number of working days lost, both by workpeople involved in disputes, and those thrown out of employment in consequence at the establishments concerned, have been approximately: 1919, 34,900,000 days lost; 1920, 27,100,000; 1921, 86,000,000; and 1922 (to June), 18,800,000. Disputes involving less than ten people, and those lasting less than one day, are not included in these statistics, nor are the days lost in establishments other than those in which the disputes actually occurred.

PERSONAL.

Mr. V. L. M'GRATH, Chief Clerk and Cashier, Accountant's Department, Aldershot Gas, Water, and District Lighting Company, and Mr. E. L. PONSFORD, Secretary's Department, have just passed the intermediate examination of the Chartered Institute of Secretaries. Mr. Ponsford, A.C.I.S., has been appointed Assistant Secretary to the Company.

The King of the Belgians has conferred upon Mr. ROBERT W. WILSON the decoration of Chevalier de l'Ordre de la Couronne. Mr. Wilson is a Director of the Imperial Continental Gas Association, having been appointed to a seat on the Board in April last, on the completion of 50 years' service with the Association, for 26 years of which he occupied the position of Secretary.

Mr. A. C. WHITNEY, Chemist to Messrs. Goodall, Clayton, & Co., Ltd., Carbonizing Engineers, Leeds, has been appointed Manager of Works to the Carbon Products, Ltd., Bombay, India. Mr. and Mrs. Whitney will sail on Friday in the P. & O. s.s. *Malwa*.

OBITUARY.

The death took place last week at Bearnett House, Wolverhampton, of Lieut.-Col. HENRY HERBERT WARD, J.P. The deceased gentleman, who had been ill during the past month, was elected a Director of the Wolverhampton Gas Company in August, 1899, and was appointed Chairman in October, 1916, in succession to the late Mr. B. O. Clark.

Ordertakers and Salesmen.

Man loves companionship, says Mr. J. H. Hartog, of Portland (Ore.), in an address to the employees of the Gas Company on the subject of selling. People love to talk. Few are good listeners, and the real salesman talks just enough to lead his customer on to do some talking. The foolish salesman talks a customer into a purchase, and then out again. It is more harmful to say too much than not enough; for in the latter case the customer may do some thinking or talking himself, while with the over-loquacious salesman the customer "stands no show." It's all in the will, and the manner. More sales to Mr. Hartog have been made impossible by the salutation of the sales girl or man than in any other way. It takes tact and knowledge of human nature to size-up people. There is no hard-and-fast rule. The real salesman sizes-up his people, watches their eyes, and from their actions forms his mode of attack. Can an "ordertaker" become a "salesman"? Yes, replies Mr. Hartog to his own question, and very easily, if he has energy and common sense. Instead of wasting his noon hour of freedom, he should visit stores and see how salesmen approach him, and which manner attracts or repels him. Inside of a month of daily study of this kind, and he will surprise himself by his improved diplomacy. He should mark down just what was said—in what tone, and when. Then he should jot down just how it made him feel. Added to this, the prospective salesman should in the evening take half-an-hour to meditate over the results of the noon hour observations, and to live the experience over again. Some things would then stand out clearer than they did at the time they actually happened. In a gas showroom, to step up to all the callers and question them is not the course advised by Mr. Hartog; but how to get to talk to them then? This is what he recommends: Just get busy adjusting some appliance, and note how the public want to see what you are doing. There's your chance to start a conversation which eventually leads to sales—or at least sows the good seed.

Elaborate Housing Schemes.—Sir Alfred Mond, speaking at a recent dinner on the housing schemes, said that at the beginning of next year 220,000 houses would have been provided. The capital outlay was enormous, and involved an annual cost to the taxpayer of over £9,500,000. Some of this money might have been saved earlier. Houses were erected at a cost of £1300 each which to-day were costing something in the neighbourhood of £450. He did not pretend the housing problem was solved, and he did not know it was solved before the war. They had built a house of too elaborate a type; and he was prepared to go back to a simpler, cheaper type of building, that the working man could afford to pay for, and which would meet his requirements.

ELECTRICITY SUPPLY MEMORANDA.

THERE has been some correspondence in "The Times" on the subject of the attitude of the British housewife to electrical appliances. She does not seem to take very kindly to them; and in this she shows her strong common sense. The "Electrical Review" calls attention to the views expressed in the letters. The introduction to the correspondence was a letter which gave one the impression of being a clever bit of propaganda work. The writer of the letter was filled with amazement and regret that the British housewife should be so unenterprising as not to adopt electrical labour-saving devices in her home. Our friend the "Review" grants that the reasons for comparative neglect of electrical appliances, "in spite of their admitted advantages," are generally well-known to the industry. They are also getting better known among the public. From the letters, it seems that those "reasons" are the initial cost of the appliances, the lack of hire-purchase systems, insufficient education by exhibitions, the complication of electricity tariffs, and the high price of electricity and installations. There are several other reasons regarding which the public have gained knowledge; and these, it is singular to note, are not specifically mentioned in the correspondence. The initial cost of the appliances is a matter that the public views relatively to the cost of other appliances which will do the work more promptly and cheaply than electricity. The lack of hire-purchase systems is due to the expensiveness of the appliances, the capital that would be involved, and the consequent heavy terms that would have to be imposed on householders. As to the insufficient education by exhibitions, electricity has been prominent at practically all the exhibitions of recent times, save at the Woman's Exhibition. The effects of the complicated electricity tariffs, and the high price of electricity and installations, are well recognized. Consumers have found that at any time the costs of electricity for heating and cooking are very heavy, inasmuch as one cannot get from a unit of electricity more heat than it is capable of yielding, and, whatever may be the efficiency of electrical appliances for a given purpose, this will not counterbalance the expense of the first cost of the current. It is also mentioned by the "Review" that two or three correspondents expressed their inability to understand why power charges should be lower than those for lighting. Few consumers ever will understand this, and, if ever they do, they will wonder why all the general charges are loaded on to lighting, and why power charges should in that respect go free. On the other hand, there were among the correspondents people who objected to having to provide separate circuits for power and lighting, which is not surprising. In view of this, one or two of the letter writers favoured the bi-part system, with an alien basis such as rateable value or floor area for the primary charge. The struggles of electrical men to get to a popular tariff are rather amusing in their grotesque results. What has rateable value or floor area to do with the costs of generating and distributing electricity? Another correspondent advocated what all consumers would like, but electricity undertakings cannot entertain—that is, the remission of the cost burden of installation which the consumer has to bear. In other words, those consumers who adopt electric cooking and heating would like to have the costs spread over the charges for electricity to all consumers!

Reasons for Neglect of Domestic Electrification.

Old and Unsuccessful Remedies.

Our contemporary thinks that while these matters are allowed to go unremedied, there is need for more general recognition of the disability under which electricity labours. It does not say exactly which matters are referred to. Presumably it means all of them. But it is questionable whether they are "all" remediable. We were under the impression, judging from the discussions that have taken place, that the disability has long since been recognized, and that there had been some very earnest work on the part of electrical men to do as much as possible to lighten it, or at any rate part of it. But it appears that they have not been very successful. Electric cooking and electric heating are not new. They have been with us for years—long before war costs assumed such dimensions that they added to the hindrances to an already tardy progress. But with all the effort that has since been made in the way of propaganda, electric cooking and heating have not climbed very far. However, the "Review" thinks that each undertaking might do its best by instituting at least one of the following necessary "reforms:" The two-part tariff; free wiring; gradual repayment of cost by consumers; a comprehensive hire or hire-purchase system; a more generous extension of mains; and a scheme for the education of the consumers or the prospective consumers. There are some electricity undertakings that have applied all these. They have had little spurts in adoption by householders of electric cooking and heating, which have for a time been encouraging. The limits of the spurts, however, have been very restricted; and then extension of adoption has dropped down to almost nothing. Another disappointment, too, is the number of consumers who, after a period, cease to use electric cookers, as well as "radiators," or gradually lessen the use of the latter. They find the former too unreliable; and the cost of work on the hotplate too great. As

to radiators, cold weather and prolonged use make fat accounts and an immeasurable volume of indignation. The need for intensive electrical propaganda for making headway is fully apparent. There are signs, too, that electrical men have been taking a hand in the agitation against "large" gas accounts. They never miss an opportunity. They did not when the attempt was made to develop carbon monoxide into something of a frightful character. They wanted to gain custom then by helping to scare gas consumers. They are trying to do the same now on the questions of therm charges and enormous gas accounts. The evidence of the books of gas undertakings is that there are not many accounts that are abnormally high, and the complaint is not general. There are many gas accounts that are actually less than they were in the corresponding quarter of last year; others show a rise such as might be expected from the differences in atmospheric conditions. But the total revenue and consumption of not a few undertakings have not increased beyond the normal rate of progress. That is a complete answer to any assumption that high gas accounts are general.

Insufficient Carrying Capacity.

Of course, there are some electricity undertakings that are not in a position to press for extended custom for cooking and heating purposes, through the lack of sufficient carrying capacity in their cables; and it would not pay them to enlarge them for intermittent loads of low-priced units. They know full well that the cooking load would frequently coincide with other loads—such as the industrial or the lighting. Also that, if the heating load could be considerably developed (if price would permit), it would be a veritable bugbear to them on the severest days in winter. In many districts this would involve a large capital and maintenance expenditure for short flights in consumption, with weeks and months when there would be no compensating business of equal amount. A correspondent of the "Electrical Review" states that he has "for several years" been endeavouring to get the South Metropolitan Electric Light and Power Company to supply sufficient current to his private house to enable him to carry on electric cooking "in a proper and thorough manner." But though the endeavour covers "several years," the consumer has only been able to get the Company to lay mains, at his own expense, sufficient to give him a supply for lighting and cleaning purposes. The writer bears good testimony to the business acumen and efficiency of the Gas Company supplying his district; but it is clear he does not make sufficient allowance for the technical superiority in storage and distribution of a gas over an electricity undertaking. He writes: "If the ordinary householder, who is no more interested in electricity than he is in gas, has to go to as much trouble to get electricity installed as I have done, I can well understand that the electrical industry can never go ahead in a thorough manner. If I were to write to the Gas Company in a similar strain, asking it to give me adequate gas supply for any purposes, its representative would be waiting on my doorstep any time from eight o'clock in the morning until ten o'clock at night." The reply the writer has so far received from the South Metropolitan Electric Supply Company reads as follows: "In reply to your letter of the 17th inst., we regret that the position is no better than it was when we were last in communication with you regarding heating load at your residence, and the demand you have now installed is the maximum we can deal with on our existing network." This means that to increase the heating business, the carrying capacity of the network of the Electricity Supply Company will have to be increased. The question arises, Is the demand sufficient, at the price charged per unit for heating, to make this a paying investment?

Immersion Kettles.

A departure from the ordinary design of electric-kettles has been brought out by Townshends, Ltd., of Birmingham. Hitherto, water has had to be boiled in a kettle with a base that must have absolute truth, or there has not been proper electrical contact with the heating element. The alternative was a kettle with (at the base) the heating element as an integral part of it. The latter has the higher efficiency, but it is expensive and unreliable. The "departure" is described in the "Electrical Times." The heater is an immersion one; and the heating element is attached to the lid of the kettle with which it forms a self-contained unit. The heating element depends from the lid, and is immersed in the water in the kettle. Electrical connection is made at the top of a central tube running through the lid to the heating element. The standard loading is 500 watts; and this system of heating, it is said, gives approximately 100 p.ct. efficiency. There must be losses to some extent through radiation and otherwise, so that it is ridiculous to talk about 100 p.ct. efficiency. But this is not emphatically insisted upon. We get it described later on as a "very high electrical efficiency." There is the assertion that "electrical efficiency is independent of the state of the exterior surface of the kettle or vessel to which the system is applied." We are disposed to question this.

Dual Management.

An Emergency Committee has been making various recommendations at Newcastle-under-Lyme regarding certain features in the management of the Electricity Department. Among them is one that the Council should immediately consider the question of the appointment of one manager under one committee for both the Gas and the Electricity Departments. It is stated in the "Electrical Times" that the placing of gas and electricity departments under one management is a process which in other times long since was tried and found disastrous. The names of those towns are not given, nor are the names of those places where the two undertakings are under a single management, and are running along and developing together quite comfortably. The opposition to dual management coming from the electrical side is altogether a negation of the merits of electrical operation, which merits (according to the electrical enthusiasts) are of an order that should carry electricity anywhere and everywhere, despite any amount of bias, which exists more in imagination than in fact. Bias generates more by division than by combination. When a gas engineer has an electricity plant under his care, he has to work as energetically for it as for his gas plant. Even if he does not, people in the district will have just what they want—gas or electricity. American gas engineers are not different from British ones; and a great number of electricity plants in America have been founded, worked, and developed to magnificent proportions by men who were at one time gas engineers only. How does the "Electrical Times" account for this state of things?

Progress of the Industry.

A review of "Garcke's Manual of Electrical Undertakings" in "Electrical Industries" is informative. The "industry" comprises many branches—supply, traction, telegraph, telephone, manufacturing, and miscellaneous enterprises. The total capital involved is £601,020,285. Returns are included from 198 electric supply undertakings, with a capital of £74,605,794, the average yield on which is put at 5·79 p.ct. The companies have 1,130,993 KW. of plant installed; and the municipalities 1,660,674 KW.—together 2,791,667 KW. The load connected (30 watt equivalent) is 61,489,733 in the case of companies, and 108,501,500 in the case of municipalities—together 169,991 233. The units sold by the companies last year numbered 1,298,223,735, and by the municipalities 2,379,266,471—together 3,677,420,206.

THE GAS ACCOUNT AGITATION.

The National Gas Council and an Inquiry into the Therm System.

SEVERAL of the daily newspapers have opened their columns to complaint regarding higher gas bills, and have done their best to aggravate it by an amount of superficial comment. The "Daily Mail" has been prominent in the matter; and to the Editor of that paper the following letter has been addressed by the National Gas Council:

THE NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

30, *Grosvenor Gardens, London, S.W.* 1,
Aug. 4, 1922.

SIR,—To the "immediate and impartial inquiry into the therm system" which you advocate, the gas undertakings of the country would offer no opposition. They, on the contrary, have every reason to welcome any inquiry into their policy and working.

Such an inquiry would naturally involve trouble and expense. On the balance, it might be found that the trouble and expense had not been in vain; for inquiry would inevitably show the groundlessness of the complaints which have been levelled at the new system of charge, and might lead gas consumers to investigate and understand that system, which the Government, acting upon the advice of the Fuel Research Board, have obliged the industry to adopt.

The main purpose of the Gas Regulation Bill of 1920, which only incidentally introduced the therm system, was to remedy the serious financial hardships which pre-war legislation had inflicted, and was inflicting, upon the gas industry under war and *post*-war conditions. That is why Mr. Bridgeman said that the Bill was "a measure introduced in response to a great many appeals from gas companies." The therm system clauses in the Bill were introduced on the recommendations of the Fuel Research Board, and not "because the gas companies wanted it." The system is, however, a perfectly fair one, and is in no way responsible for the abnormal size of any person's gas bill. That it has been responsible for serious misunderstanding of the facts of the case—misunderstanding which is causing the public unfounded apprehension—is its only drawback, as an impartial inquiry would immediately and clearly establish. It was solely because of the complication it would at first introduce, that gas managers, who attach great importance to the confidence of the public, were opposed to the change.

In regard to variations in individual accounts, which inevitably occur from time to time—and which gas managers are always ready to investigate carefully—it may be pointed out that, if (as they are being constantly advised to do) consumers would only check their consumption of gas by reading the index of their meters at regular intervals (say, weekly) they would have no difficulty in explaining periodical increases or decreases in the amount of gas used. If such a practice were more generally adopted, gas consumers would be able to investigate at the time the causes of increased consumption in comparison with corresponding periods—such causes as variations in weather conditions, the occurrence of coal strikes, differences in periods of account, &c.—causes which, after a lapse of time, it is often very difficult to recollect.

(*Signed*) W. J. SMITH,
Secretary.

THIN METAL STANDPIPES.

As a remedy for stoppages in ascension pipes, Mr. N. G. Caputi suggests employing a pipe so designed that favourable temperature changes can be effected. Such a pipe was constructed at the plant of the Grand Rapids Gas Light Company, and installed on some of the machine-charged coal-gas benches. The pipe is of rectangular prismoidal design, made of 12-gauge steel with welded joints. The cross-section of the pipe between the bridge-cap and the top of the retort was made 12 in. square, and at the points between the mouthpieces and buckstays 8 in. square, finally tapering into a round spigot 9 in. in diameter to fit the offtake of the mouthpiece. The bridge-pipe, of the same material and general design, was made a unit with the standpipe, and attached with flanges to the dip-pipe at the top of the hydraulic main.

The advantages of this type of pipe over the present cast-iron one in use would, he says, be that the labour expense would be decreased, due to a minimum number of stoppages. At Grand Rapids it is estimated that the cost of removing stoppages would be reduced one-third. Burning-out of pipes would be eliminated, thereby increasing the gas yield, and also preventing the cracking of mouthpieces and pipes. There would be an appreciable reduction of temperature in the hydraulic main. As a matter of fact, it had been planned to instal a primary condenser in the retort-house to cool the gas better before reaching the exhauster; but with the possible reduction of 200° Fahr. in the hydraulic, this proposition was reconsidered. The cost of maintenance would be far lower than that of the cast-iron pipe; and the Grand Rapids type of pipe can be installed on existing benches of retorts without any changes in the hydraulic or mouthpieces. There a few disadvantages, which could with use, Mr. Caputi says, be "ironed out." Should this pipe for any reason become badly stopped, it would not withstand the burning-out process. Slight stoppages, however, have been burned-out under careful supervision. Because of the size of these pipes, the space between and about them would be greatly restricted. Unless all benches have no irregularities, the pipes would not be interchangeable.

The theories on which the design of this type of pipe is based are principally: (1) The increased radiation over the cast-iron pipe due to the thin material used and the increased perimeter of exposed surface. (2) Due to the increased cross-section, the velocity of the gas is greatly reduced, which adds to the radiating effect. (3) The comparative smoothness of the interior walls of the pipe offers less possibility of any incrustations adhering to the walls. (4) The coefficient of expansion of the sheet steel is greater than that of cast iron. Therefore any changes in temperature produce a greater differential in expansion between the steel and the deposit; and this causes any deposit to become more easily dislodged. (5) Greater condensation is induced; and this prevents adhering of tarry material to the walls. There are now three benches completely equipped with thin sheet-steel standpipes. Two are giving excellent results; and the third bench will be soon in operation.

After the first bench had been put into operation, several simultaneous readings were taken at ten-minute intervals to determine the relative temperature of the two styles of pipes—the thin-steel and the cast-iron pipes adjacent—subjected to the same conditions. These showed that for a period of six hours the average temperature of the steel pipe was 430° Fahr., and that of the cast-iron pipe 621° Fahr.—an average difference of 191°. Subsequently tests were conducted to determine the difference in temperature between the tops and bottoms of the two pipes. There was an average of 266° Fahr. at the top of the steel pipe and 1150° at the bottom; difference 866°. With the cast-iron pipes, the average at the top was 441° Fahr., and at the bottom 1000°; difference 559°. These tests corroborated the fact that the standpipes were the hottest immediately after charging the retort, and coolest at the time of discharging.

Synthetic Nitric Acid.—The success of the Haber-Bosch process for synthesizing ammonia from atmospheric nitrogen and the wide development of the cyanamide process are, says the "Coal and Iron Trades Review," well known; but these processes are complicated if the nitrogen be required in the form of nitric acid. The cyanamide process involves five stages: (1) The manufacture of calcium carbide; (2) separation of pure nitrogen from the air; (3) reaction of nitrogen with calcium carbide; (4) hydrolysis of the cyanamide; and (5) oxidation of the resulting ammonia to nitric acid. In the Haber-Bosch process the same result is attained in four stages: (1) Preparation of the nitrogen-hydrogen mixture in a gas-producer; (2) interaction of carbon monoxide and steam, and very complete purification of the gases; (3) catalytic synthesis of ammonia in high-pressure vessels; and (4) oxidation of the ammonia. This process is simpler, but involves great wear and tear of the high-pressure apparatus used. On account of its simplicity, the explosion process, the development of which is described by Prof. F. Häusser in the "Journal of the Society of Chemical Industry," contrasts favourably with the above two systems. It proceeds directly from nitrogen to nitric acid, and, apart from the removal of sulphur, the gases require no special purification. There is, moreover, less wear and tear on the apparatus, which is much simpler than that required in the arc process. Further development is foreshadowed.

ROBERTS PATENT COKE-OVENS.

In connection with the new coking plant of the St. Louis Coke and Chemical Company, at Granite City (Ill.), Roberts patent ovens are producing metallurgical coke from the highly volatile Illinois and Indiana coal; and writing on the matter in the "American Gas Journal," Mr. H. J. Gifford says that the invention of this oven, "of baffle-wall structure," marks an epoch in the development of the gas industry, as well as in its allied interests. Because of the vastness of the coalfields referred to, it had long been deplored that, due to the high volatility of the coal, the production from it of bye-product coke had been impossible.

There are eighty of these Roberts ovens at the St. Louis Company's plant, operated in two batteries of forty each, and one blast-furnace of 500 tons capacity. Coke-oven gas and tar are used to heat the furnaces. The salient feature of the Roberts oven is the baffle structure in the wall. This method of construction is claimed to effect more rapid heat absorption from the gases in the combustion chamber than is generally the case with ovens of "flue-like" construction. Mr. Gifford goes on to explain that, instead of the common regenerators to pre-heat the air, which were used in a previously designed oven for coking highly volatile coal, the Roberts ovens are constructed with recuperators made entirely of silica brick, which cover the whole space under the ovens, except the dividing wall. These recuperators are in two separate sections. The waste gases travel through two passages in each of the sections, and each section is made-up of sixteen flues arranged in four rows. The air currents flow upward on the outside of the flues, through which, on the inside, the gases move in the opposite direction. As the air passes upward out of the recuperators, it rises through the centre wall, and fills the top of the oven chamber, after which it passes over the wall and downward. After giving further details of operation, the writer says that simplicity of construction and the minimizing of working costs characterize these ovens. With the knowledge gained through the period of experimenting, it is regarded as certain that it will be possible to construct a standard oven of the recuperative type that will be as economical in the consumption of gas as any regenerative oven that has ever been built.

In order to obtain the benefit of maximum tonnage, using narrow coking chambers, the ovens are built to a height of 13 ft. 9 in., for, since the ordinary lean coke-oven gas of high oxygen content burns with a short flame, the gas must be distributed and burned while maintaining a uniform temperature in the high wall. In the coke-oven wall, the Roberts standard type of coke-oven construction is used, which provides for a combustion chamber permitting communication throughout its entire length, except where the baffle structure appears, partially isolating the three end burners. The extra heat required to keep the ends at uniform temperature with the other sections of the wall is provided for by means of the baffles, with the aid of draught regulation. The introduction of gas into the coke-oven wall at more than one point in its elevation does not present any operating difficulties. Only 50 p.ct. of the gas is introduced at the point where the 100 p.ct. of air is taken in.

The time required for coking has varied as much as from twelve to twenty-four hours. It has been found, in changing from one coking time to another, that the over-all efficiency of the recuperators for heat recovery is materially affected. The initial cost of the recuperator type of oven is greater than that of the regenerator type; but when the economy of operation is considered, the relative cost is practically the same. Peculiar to the Roberts type of oven wall, because 100 p.ct. of air is introduced at the primary gas duct, together with 50 p.ct. of the gas, the combustion taking place in the mixing chamber, the flame temperature is reduced to a very perceptible degree, causing in turn a more uniform distribution of heat in the entire length of the wall. The baffle structure of the oven begins below the point where the gas is introduced, so that here more of the surface is exposed to the flame, resulting in a higher rate of heat extraction. A table of the results obtained at Granite City shows that the amount of breeze is only 3·7 p.ct. of the total coke produced; while the quality of coke from highly volatile coal is good, and satisfactory for use in blast-furnaces.

Purification of Coal Gas.—A very readable review, written more or less for the lay reader, of the problems with which the gas engineer is faced when attempting to satisfy the consumer as regards the quality and cost of his commodity, has been contributed by Mr. Horace Chamberlain, of Sheffield, to the Fuel Section of the "Colliery Guardian." The article is entitled "The Purification of Coal Gas," and in the course of it Mr. Chamberlain says that where no hydraulic main is used, and especially in vertical retort installations, where the temperature of the gas issuing from the retorts is high, the trouble from chloride deposits is greatly increased. Some attempts have been made to separate this ammonium chloride deposit, and to prepare it in a suitable manner for sale. The author does not know the details of a reliable method, but he believes that the Shelton Coal, Iron, and Steel Company, at their bye-product works, have been successful in isolating the ammonium chloride and purifying it chemically for sale.

THE MECHANICAL HANDLING AND STORING OF MATERIAL.*

Reviewed by G. M. Gill, M.Inst.M.E.

In this large and comprehensive book by Zimmer there is presented to the reader a full description of the many methods of handling material by mechanical means. To any engineer who is engaged in designing plant embodying mechanical handling (and what plant does not?) this volume is invaluable; and the writer has formed the opinion that, used as a reference book by designers, it will prevent the adoption of obsolete methods and be suggestive of more efficient means of solving the many problems connected with the subject.

The volume is large, and contains 804 pages of more than average size; it is profuse with no less than 1143 illustrations; and the descriptive matter is clear to the engineering mind. There are no fewer than 44 chapters, which cover the subject as well as so large a field can be covered in one volume. The index is a good one, and the reader is enabled to refer to any desired section without loss of time. The illustrations are excellent; while the paper is of good quality, and the type used will commend itself.

The author has divided his chapters into main headings, as follows:

1.—Continuous handling.
2.—Continuous handling by pneumatic and hydraulic means.
3.—Intermittent handling.
4.—Unloading and loading appliances.
5.—Unloading of railway wagons.
6.—Miscellaneous installations.
7.—Automatic weighing of material.

To the gas engineer there are several chapters of special interest. The author deals fully with elevators and conveyors; while a special chapter is devoted to the "Handling of Hot Coke in Gas-Works;" this embracing the best-known methods of dealing with the problem, though the system of telpherage, which might well receive fuller attention, is reserved for a later page. Pneumatic systems, which have now some interest to gas engineers, are described by the author; while the novel method of pumping coal in a current of water from quayside to works (a distance of one-third of a mile as adopted at the Hammersmith Borough Council's Electric Power Station) is fully described. In this case the coal passes underground in an 8-in. pipe line; the problem of transporting it cheaply through a densely-populated neighbourhood being thus satisfactorily solved, as can be endorsed by the writer, who has himself inspected the installation.

The coal and coke handling plant of the Bristol Gas Company is chosen by the author as a typical gas-works installation, as is also the small coal-handling plant of the Brentwood Gas Company. The coke storage plant of the Glasgow Corporation at the Provan Gas-Works is described and illustrated; but this installation is of special design, and is certainly not typical of the methods commonly adopted by gas engineers.

Much information is given of plant which rarely finds a place in gas-works, in which the methods adopted are, it can hardly be denied, of a somewhat commonplace nature, not showing that originality of design which is to be met in the works employed in some other industries. A perusal of this work would undoubtedly be suggestive to the gas engineer-designer who has full scope for originality in building or extending gas-works plant.

The extent to which conveyors and elevators are employed for handling materials may be gauged by the fact that no less than 18 of the 44 chapters deal with these types of appliance, for the use of which there is in this country immense scope, if one is to judge from the great numbers of such pieces of apparatus which can be seen in any American works.

A short chapter is devoted to "Automatic Feeding Devices" as applied to elevators and conveyors, which are too often installed with no provision for feeding; this resulting in the inefficient working of such plant to an extent which often passes unnoticed. This chapter, though brief, is recommended for perusal by engineers having unfed elevators and conveyors under their charge.

The author, in dealing with the wear and tear of elevating and conveying machinery, publishes a table compiled by the late Mr. W. R. Chester, of the Nottingham Gas-Works, in which are included nine types of such plant working under Mr. Chester's supervision. It is noticed that the cost of repairs and renewals per ton for 100 ft. of traverse varies from 0·082d. to 0·377d. for coal, while for coke the corresponding figures are 0·938d. to 2·070d., which difference will not be a matter for surprise to the gas engineer.

In Chapter XXIX. the author deals with methods of handling the coke from coke-ovens. While this chapter deals fairly fully with the best known methods employed in this country and on the Continent, there is no mention of the type of plant almost universally adopted in the up-to-date coke-oven works in the United States, where very effective means have been installed to handle large quantities of hot coke carefully, rapidly, and economically, and yet in such a way as to quench it with a minimum quantity of water. The writer had the privilege recently of visiting a number of the most modern installations of coke-oven plant in the United States, and can testify to their claims for inclusion in Mr. Zimmer's book. In this connection, the writer has noticed a tendency on the author's part to take a good deal of his subject-matter from the Continent, possibly at the expense of the United States, where (it is universally recognized) a good machine is appreciated perhaps more highly than in any other country in the world.

To gas engineers interested in coke-handling there is a device, which merits some attention upon their part, used for the loading of coal into ships and barges. Many gas engineers have doubtless been impressed with the considerable breakage of coke which results from the loading of such fragile material into barges. The device in question (illustrated on p. 641) practically consists of a descending elevator into which the coke is fed at the top; the weight of coke being sufficient to cause the elevator to descend until its load is released at the bottom, with little or no drop. The lack of practical methods of handling coke must often have impressed the thoughtful gas engineer who has no satisfactory means of lifting coke from store into sacks or vehicle, while removing the breeze at the same time. There is further no proved means of dropping a definite amount of coke from hopper into sack. Again, the usual methods of screening coke afford great scope for improvement; the abrasive and fragile character of the material being two factors which require special attention on the part of the designer of such apparatus. This is mentioned in the hope that Mr. Zimmer will himself give some special attention to the subject and deal with it in the next edition, though presumably the question of screening materials hardly falls within the scope of the volume.

The author deals with various portable stackers and loaders, which useful pieces of plant could with advantage be used on a much larger scale in gas-works in this country. In the United States these small portable elevators and conveyors are largely used for the handling of coal, coke, breeze, oxide, and such materials in gas-works, and there is undoubtedly considerable scope for their adoption in all but the smallest works.

No mention is made of breeze-washing plant, but possibly such a subject does not fall within the limits of the work.

In the chapter on unloading appliances no mention is made of the Williams' grab, which has some substantial advantages over some other types of single-chain grabs described.

The author has not included the handling of materials by possibly the most general of all methods—namely, locomotive haulage. It is difficult to appreciate the reason why this simple means of transporting material is excluded, though it is probable that the author could supply the answer.

It is noticed that the term "labour aiding," as applied to machinery, is used instead of the prefix more commonly employed—namely, "labour saving;" the former being undoubtedly the better description of the object of machinery.

In conclusion, this book by Zimmer, who is a very well-known authority on mechanical transportation, can be strongly recommended as an able and comprehensive work on this subject; and the author is to be congratulated upon the production of so admirable an account of the many and diverse methods employed in the mechanical handling and storing of material.

* "The Mechanical Handling and Storing of Material." By George Frederick Zimmer, Assoc.M.Inst.C.E. London: Crosby, Lockwood & Son. Price, £3 3s. *net*.

Storage Capacity at San Francisco.

Gas is furnished by the Pacific Gas and Electricity Company to the city of San Francisco from two manufacturing stations—the Metropolitan plant, with a daily capacity of 6 million c.ft., and the Potrero works, having an output of 30 million c.ft. per diem. The latter plant also supplies gas under high pressure as far as Palo Alto, a distance of approximately 34 miles. Gas is supplied to the major part of the city by means of low-pressure distribution; but for certain areas the gas is transmitted at from 25 to 30 lbs. pressure, and reduced by governors before it reaches the consumers. The demand for gas has been steadily increasing from year to year since 1911, at which date there were 72,377 consumers. This number, by 1921, had been increased to a total of 135,000. During recent years the people of San Francisco have begun to realize that gas is the ideal fuel for heating, with the result that large numbers of installations are being made in offices, homes, and public buildings. In addition, gas is being used in all branches of industrial work. This has resulted in a very large increase in consumption during the winter just passed. A maximum day's send-out of 27,278,000 c.ft. was recently established, representing an increase of 21 p.ct. over the previous year's record. At the present time the storage capacity is 11 million c.ft.; and up to now this has been sufficient, on account of the great capacity of the Potrero generators. Now, however, the erection of a 10 million c.ft. holder has been decided upon, this being the most economical size for a large storage holder—though an initial difficulty was that, owing to the diameter of the tank, it was impossible to find a city block which would contain the holder without encroaching on a public street. It will be a five-lift holder with steel tank.

Dr. E. Graefe describes in the "Brennstoff-Chemie" of June 1 a pressure reduction lignite tar distillation system, in which there are eight continuous stills. The still temperatures range from 200° to 320° C. The final distillation to coking takes place in special cast-iron stills. One of the advantages claimed for the process is that good lubricating oils and paraffins are obtained.

CARBONIZING IN INTERNALLY HEATED RETORTS.

Large-Scale Production of Smokeless Domestic Fuel.

By E. R. SUTCLIFFE, Wh.Ex., Assoc.M.Inst.Mech.E., and EDGAR C. EVANS, B.Sc., F.I.C., M.Inst.Min.E.

A lengthy paper on "Recent Developments in the Technology of Fuels" has been contributed by Messrs. E. R. Sutcliffe and Edgar C. Evans to the South Wales Institute of Engineers, in which, among other matters, the authors deal with the subject of carbonizing (with preliminary briquetting) in internally heated retorts. Certain portions of the paper have been taken from the published "Proceedings" of the Institute.

The authors advanced the following general advantages for briquetting prior to carbonization, in connection with the purpose they had in view:

(1) It widens considerably the range of coals suitable for treatment for the production of smokeless fuel.
(2) Most British coking coals briquetted with 25 p.ct. of coke breeze without a binder, and subsequently carbonized, give an excellent smokeless fuel.
(3) Many coals which are generally regarded as non-caking produce an excellent coke if preliminary briquetting is resorted to.

Generally speaking, low-temperature carbonization processes have developed along three general lines:

(1) The adoption of externally heated retorts.
(2) Retorts in which the coal is carried by mechanical means through the heated chamber.
(3) Internally heated retorts.

The authors went very fully into the possibilities of these three systems. In so far as externally heated retorts were concerned, they were forced to the conclusion that, while they offered possibilities of technical success, yet their possibilities of economic or commercial success were extremely doubtful, and that, as a general type, they offered serious disadvantages for large-scale work. Rightly or wrongly, the authors had before them the dream of carbonizing the whole of the bituminous coal output of the country—large and small—and they felt that this dream would never become possible of realization through the medium of retorts of such low capacities as this system necessitated.

A second method of attacking the technical problems is that in which the coal is continually conveyed through the retort by mechanical means. One well-known sample of such a system is the Del Monte process, in which the coal is passed through a retort by means of a worm conveyor. Another system which is attractive in some respects is the Pringle Richards, in which the coal is passed through the retort by a conveyor of a special type. Other systems on somewhat similar lines are the Nielsen and "Fusion" retorts. The authors, however, on finally determining on a general system for the large-scale production of smokeless domestic fuel, decided to do away with all the ideas of mechanically conveying the coal through the retort, and to adopt the simplest and cheapest conveying system known—viz., gravity—to effect the passage of the charge.

PRODUCTION OF SMOKELESS FREE-BURNING FUEL AT HIGH TEMPERATURES.

They, however, had to overcome all of the risks of jamming, fusing, and wedging that were possible in a continuous vertical retort; and for this reason they ultimately adopted a process which is somewhat revolutionary in conception, and which breaks away entirely from the usually accepted ideas relating to the production of smokeless fuel from coal. In accordance with the ordinary conception of carbonization, an attempt is generally made to leave sufficient volatile matter in the coke to render it easy to ignite and capable of burning freely in an open grate. In the process finally adopted by the authors, they decided to carbonize the coal, not at a low temperature, but at temperatures which ran up to the highest known in practice, and to leave in the resulting fuel as little volatile matter as possible. They had proved that, under suitable conditions, coal could be carbonized at the usual temperatures of gas-works or coke-oven practice and still produce a coke which would be free burning and also comparatively easy to ignite.

Before passing to discuss the method by which this result was ultimately attained, it might be advisable to outline briefly the experimental work on which the process is based. By briquetting mixtures of (1) caking and non-caking coals, (2) raw and preheated resinous coals, or (3) resinous coal and coke breeze, under suitable conditions and without a binder, it was found that briquettes could be obtained which retained their shape when carbonized at either high or low temperatures. Considerable experience of briquettes of this type had been gained at the Leigh Works of Messrs. Sutcliffe, Speakman, & Co., in connection with the processes of Pure Coal Briquettes, Ltd. This Company had been formed by the late Lord Rhondda for the purpose of developing a process of making coal briquettes without a binder. In the course of the work done on pure coal briquettes, it was found that under suitable conditions briquettes made according to this process, when carbonized even at the highest temperatures known in gas-works or coke-oven practice, possessed the remarkable property of retaining their shape on carbonization, and further of being capable of ready ignition and of burning freely in the domestic grate. The following results of a test made may serve as an illustration of the properties of the new material.

Report on Comparative Burning Tests of Foundry Coke, Gas Coke, and Coke Made by Pure Coal Briquette Process.

—	Foundry Coke.	Gas Coke.	Coke Made by Pure Coal Briquette Process.
	P.Ct.	P.Ct.	P.Ct.
Ash	12·15	17·9	11·5
Volatile matter	0·6	1·3	0·4
App. sp. gr.	1·28	0·86	0·92
True sp. gr.	1·81	1·66	1·79
Volume of coke substance	70·7	51·8	51·4
Volume of cells	29·3	48·2	48·6

The apparent specific gravity of pure coal briquettes varied according to the piece selected in these tests. The outside limits were 0·80 and 1·01.

Under the burning tests, the following figures were obtained:

—	Foundry Coke.	Gas Coke.	Pure Coal Briquette Coke.
Weight burned	12 lbs.	12 lbs.	12 lbs.
Time taken in burning	4½ hours	4 hours	7½ hours
Unburnt cinders	3 lbs. 4 oz.	2 lbs. 15 oz.	5 oz.

The foundry coke was difficult to ignite, but afterwards burnt-up bright. As long as combustion maintained its vigour, a bright-red heat obtained, but on slackening the fire quickly blackened and went out. The gas coke behaved in much the same manner, being easier to ignite, and burning rather more quickly, than the foundry coke. "Pure coal briquette" coke burns similarly to foundry coke when in active combustion. On slackening, however, it does not turn black and go out, but underneath the ash maintains a low combustion for a considerable time. After the fire to all appearances had gone out, glowing pieces were still found among the soft powdery ash. In this way it had the same properties as "pure coal briquettes," though not to such a marked degree.

The conditions for large-scale manufacture were soon determined; but at the outset costs of production were rather high, and it was a question of reducing these to a point which would allow of commercial success being attained. Success in this direction has now been obtained, and a high-grade smokeless fuel can be made in any existing carbonizing system, at any temperature of carbonization that it is desirable to use, at a cost which makes the process a good commercial proposition. Particulars of costs are given later.

The importance of this discovery can, perhaps, be realized when it is pointed out that every gas-retort or coke-oven plant in the country can become a centre, if required, for production of high-class smokeless domestic fuel. In other words, in existing plants in this country there are potential possibilities of turning-out about 30 million tons per annum of smokeless fuels, leaving (say) about 200 million tons to be treated at a later date by plant specially erected for the purpose. We have, then, three possible sources for the production of smokeless fuel: (1) Gas-works; (2) coke-oven plants; and (3) other carbonizing systems.

The preliminary operations for the production of fuel by the "pure coal briquette" process are common to all carbonizing systems. The first primary necessity is to wash the coal. It is then ground to a size determined by the qualities required in the resulting coke. Generally speaking, the finer the coal is ground the more free burning is the resulting fuel. The size usually recommended is about a 30 mesh, which can be obtained without too heavy an expenditure of power, and at a moderate cost.

This coal is then mixed with coke breeze, non-caking coal, or pre-heated coal, in suitable proportions, depending on the character of the coal, so as to make the fuel non-expanding, and the mixture is briquetted in a high-pressure ovoid press without a binder. This press, which is specially designed for the production of heavy pressures (about 8 to 10 tons per sq. in.), produces ovoid briquettes which are hard and dense enough to pass through the retort without fracture. The resulting fuel can be sold in the form of briquettes, or broken-up in convenient size for the market. in the case of most British coals, excellent results can be obtained by the addition of from 20 to 25 p.ct. of coke breeze; and this figure has been used in the subsequent notes as being representative of the standard practice in the case of most British caking coals.

POSSIBILITIES OF THE PROCESS IN GAS-WORKS PRACTICE.

Gas coke is by no means an ideal fuel. It is generally high in moisture and ash, difficult to ignite, and by no means free burning when ignited. Any process that would enable a gas coke to produce a free-burning high-class smokeless fuel becomes at once

worthy of the serious attention of the gas engineer, and opens-up possibilities in gas-works practice of a very far-reaching character. Ultimately the matter is bound to resolve itself into a question of £ s. d. Will it pay? With reference to this point, some detailed estimates are given at the close of the paper; but generally speaking the following remarks may be of interest.

Apart from the washing cost, the preliminary cost of treatment, including drying, grinding, briquetting, and 15 p.ct. on the capital cost, will amount to from 2s. 6d. to 3s. 6d. per ton, depending primarily on the cost of grinding and the size of the plant. Against this initial cost can be placed the following advantages:

1.—The production of a fuel which is far superior to gas-works coke in these respects:

(*a*) It is extremely hard, and has a density approaching that of anthracite.
(*b*) It is much cleaner than gas coke, and is ideal for domestic fuel purposes, for anthracite stoves, suction-gas producers, or any of the other uses to which anthracite is applied. It is practically an artificial anthracite of high-class quality.
(*c*) Its free-burning qualities make it peculiarly applicable for steam-raising purposes.

2.—The production of gas per unit of plant is considerably greater than in normal practice. This is due to:

(*a*) Owing to the briquetting process, the coal is compressed to such a degree that a much larger charge can be introduced into the retort than is the case in normal practice.
(*b*) In the case of continuous vertical retorts, a much greater output is obtained per day than is usually the case.
(*c*) The volatile matter is given-off more rapidly from briquettes of this type than from raw coal, and carbonization is effected more rapidly than in normal practice.
(*d*) The briquettes do not swell, and there is therefore no need to leave space in the retort for swelling.
Generally it is estimated that 50 p.ct. more of briquettes can be carbonized in a retort than is normally the case, thus reducing considerably the capital cost of plant per 1000 c.ft. of gas produced.
(*e*) All surplus coke breeze is utilized in the process.
(*f*) A much lower grade of coal can be used in a gas-works than is usually the case—thus reducing coal costs per 1000 c.ft. of gas produced.
(*g*) Despite the fact that 20 p.ct. of coke breeze is added, the reduction of ash in the coal entering the retort is such that the gas yield per ton of coal charged is not seriously affected.
(*h*) An increased yield of bye-products is obtained.

Taking everything into consideration, the benefits obtainable, together with the increased value of the coke produced, considerably outweigh the preliminary cost of treatment, and make the proposal a very attractive one for gas-works carbonizing 100 tons per day and upwards.

Uses of the Process in the Coking and Iron and Steel Industries.

The conditions in the coke industry are very different from those in the gas industry. The primary function of coke-oven plants is to produce blast-furnace coke, and the production of smokeless fuel for domestic or other purposes is only of interest in so far as it renders the plant independent of fluctuations in the demand for coke for blast-furnace purposes. During the past twelve months a process of this type would have been a very valuable adjunct to coke-oven installations. Most of the coking plants of the country have been lying idle, with capital and standing charges mounting up, while bituminous small has been a drug on the market. If, however, these ovens had been equipped with a preliminary grinding and briquetting plant, they could have been kept going for the production of domestic fuel or artificial anthracite, for which there has been a steady demand.

Apart, however, from the possibilities in this direction—which is a consideration that would only come into play during periods of depression—there are very important possibilities involved in the production of a special blast-furnace coke of a quality superior to anything yet placed on the market. Potentialities in connection with this material have yet to be tested on a large scale in blast-furnace practice, but theoretical considerations point to the view that the adoption of this coke for blast-furnace work would enable substantial economies to be effected.

The authors have investigated the question principally from the point of view of results obtained in the case of charcoal furnaces, and they are of the opinion that a highly combustible coke would offer the following possibilities in blast-furnace work:

(1) Higher CO_2 production, resulting in increased heat per pound of fuel.
(2) Saving in carbon consumption, owing to a proportion of the ore being reduced directly.
(3) Reduction in loss by sensible heat carried away in the furnace gases.
(4) Reduced fuel consumption, resulting in less limestone, less slag, and less thermal loss.
(5) Reduction in radiation loss.

Lastly, there is another feature of considerable importance—and this is the possibility of reducing the size of blast furnaces. Apart from their low fuel consumption, charcoal furnaces have productive capacities which are often extraordinarily great in proportion to their dimensions. The lowering of the furnace burden is accomplished at a rate which is very much greater than is the case with furnaces using coke of the customary character.

If the views held by the authors are substantiated in large-scale practice, the possibilities opened-up to the British iron and steel industry are enormous, especially in the case of new plant. With a fuel of the type suggested, the capital costs of furnace plant will be very considerably reduced. Smaller furnaces, smaller blowing engines, smaller stoves, smaller auxiliary plant—all these would follow naturally the introduction of a dense fuel of high combustibility, while the average coke consumption per ton of pig in this country should be reduced to 15 cwt.—especially if suitable preliminary treatment of the ore is carried out concomitantly with that of the coke. In the case of a pure ore, there appears no reason why it should not be smelted with as low a carbon consumption as 10 cwt. per ton. It can readily be shown that, theoretically, the chemical and thermal requirements can be satisfied with as low a consumption as 8·6 cwt. of carbon per ton of iron.

If these anticipations can be realized in practice, the additional cost of production necessary to obtain a fuel of this character would be negligible as compared with the advantages that would be secured in its use. It is, however, advisable at the outset to discount to some extent, at any rate, the purely theoretical aspects, and to investigate as far as possible the total charges which the coke maker would incur if this system were adopted. Approximately, the additional capital cost required to adapt an existing coke-oven installation can be calculated on a basis of capital cost of £50 to £70 per ton carbonized per day. The additional cost of production will amount to from 2s. 6d. to 3s. 6d. per ton of coal carbonized, a figure inclusive of 15 p.ct. interest and depreciation on capital expenditure. Apart, however, from the above-mentioned advantages—which pending a large-scale trial must be regarded as hypothetical—briquetting prior to carbonizing offers other distinct advantages, which present considerable possibilities in reducing the additional cost of production of 2s. 6d. to 3s. 6d. per ton. These advantages can be summarized as follows.

Economic Advantages of Preliminary Briquetting in Coke-Oven Practice.

1.—The production at will in a coke-oven plant of high-grade blast-furnace coke or smokeless domestic fuel.

2.—Reduction in cost of coal to plant. Coke breeze or low-grade non-coking slack can be admixed to a considerable extent with the coal charged, and in many cases coals which are generally regarded as non-coking will, under this process, produce an excellent coke.

3.—Owing to the density of the briquettes, a greater charge can be introduced into a coke oven than is normally the case. This results in a reduction of the capital and labour cost per ton of coal carbonized.

4.—It has been proved that briquettes are carbonized in a shorter time than is normally the case, thus resulting in increased output per oven.

5.—Briquettes are charged free from moisture, resulting in a shorter carbonizing period.

6.—The yield of bye-products is increased. (Some further notes are being prepared on this point, as it is too lengthy a matter to discuss in detail.) It has been demonstrated that:

(*a*) The yield of tar is greater than in normal working.
(*b*) The yield of benzole is greater than in normal working.
(*c*) The yield of ammonia is increased. In some cases 50 p.ct. more sulphate is obtained.
(*d*) The yield of surplus gas is increased. [This arises from considerations 4 and 5 above.]
(*e*) The production of naphthalene is reduced.

Taking everything into consideration, there is every reason to believe that, apart entirely from the enhanced value of the coke, the introduction of a preliminary briquetting process will result in economies in working which will outweigh to a great extent the preliminary cost of treatment.

Large-Scale Production of Smokeless Fuel.

The consumption of coal for domestic fuel purposes in this country is about 30 million tons per annum. The greater proportion by far of this quantity is consumed in towns and in industrial areas, where a smokeless fuel would be an immense advantage. Only a small proportion of the demand could be satisfied by gas-works and coke-ovens. In normal times the coke-oven plants in the country are utilized to their full extent for producing blast-furnace coke, while gas-works consume a good deal of the coke they produce in their own producers, leaving perhaps 8 to 10 million tons per annum for sale. So if the whole of the domestic fuel consumption is to be supplied by smokeless fuel, it is necessary to consider the adoption of further carbonizing systems to supply the deficit.

Any system, to be commercially successful, would have to supply smokeless fuel at a price not exceeding that of large coal, and in this direction it is necessary to use much discretion in submitting an approximate balance-sheet of revenue and expenditure. Considerable prejudice was aroused in the past by the extravagant claims of some of the earlier advocates of low-temperature carbonization. Values have been claimed for the resulting smokeless fuel considerably above that of lump coal. A high yield of low-temperature tar was assumed, and a market value attributed to it considerably above that of gas-works tar.

High yields of motor spirit were claimed, and it was seriously advanced by low-temperature carbonization enthusiasts that gas-works should adopt the system in preference to high-temperature carbonization.

These claims have resulted in infinite harm being done to the matter, both in the minds of the investing public and of persons who have had a long and varied experience in the gas and coke making industries. For safety, it is better at the outset to assume the following hypotheses relative to the commercial exploitation of any system of low-temperature carbonization:

1.—The value of the resulting smokeless fuel should be taken at a figure not higher than that of lump coal.
2.—The value of low-temperature tar should be taken at a figure not higher than that of fuel oil.
3.—While an excellent motor spirit can be provided by low-temperature carbonization, due allowance must be made for purification losses.

Regarded in this light, the low-temperature carbonization of coal suffers from the following inherent disadvantages:

1.—After allowance has been made for the gas required for heating the retorts, and the power and steam requirements of the plant, very little surplus gas is available for sale or for outside uses. The process is not applicable to gas-works.
2.—If the temperature of carbonization is maintained at 500° C., a very low yield of sulphate of ammonia will be obtained. It is better not to assume more than 12 lbs. of sulphate of ammonia per ton of coal carbonized.

For these reasons, the authors decided, in so far as their general scheme was concerned, to break away entirely from ordinary low-temperature practice. They had shown that a free-burning domestic fuel could be made at the highest temperatures of gas-works practice; and in order to get a maximum yield of gas, a maximum yield of sulphate, and a hard, dense coke, they have introduced a system of carbonization by which the coal is gradually heated-up to a temperature as high as is found to be desirable.

They thus obtain all the advantages of high-temperature carbonization; and, in addition, since the coal is gradually heated to its maximum, the tars, light oils, and light spirits are expelled at low temperatures. The same yield of these products is therefore obtained as in low-temperature carbonization, and the character of the tar, light oils, and spirits is also the same. Further, in view of the financial limitations of carbonization of coal for the production of smokeless fuel, it was necessary to devise a scheme which would have these characteristics: (1) Maximum capacity per retort; (2) low capital cost; (3) low labour cost; (4) low wear and tear cost; and (5) absolute simplicity in operation.

Internally Heated Retorts.

These requirements appear to be satisfied by the adoption of a system of internal heating. One of the greatest difficulties in devising an economical system of low-temperature carbonization has been the fact that the heat conductivity of coal or coke is so low that the time taken for the heat to penetrate a charge of coal of more than 5 in. in thickness is so prolonged as to make the economical success of an externally heated system an extremely doubtful proposition.

On the other hand, if the heat could be conveyed directly to the centre of the charge, it would enormously expedite the carbonization process. The authors' experiments have shown that, under suitable conditions, it is possible to carbonize coal in so short a period as two hours, while even on a large commercial scale a carbonization period of eight to twelve hours in a retort 12 ft. to 14 ft. in diameter is within easy reach of possibility.

The general advantages of internal heating can be summarized as follows:

1.—The heat is conveyed directly to all portions of the charge from the outside to the centre, and the period of carbonization is thus considerably reduced.
2.—By suitable sizing of the material, "channelling" can be avoided, and all portions of the charge can be carbonized with absolute uniformity, thus giving a fuel of uniform composition.
3.—Retorts of wide diameter can be used, thus making it possible to carbonize very large quantities of coal in a single retort.
4.—No internal flues are necessary, thus avoiding the necessity of complicated shapes and simplifying the erection.
5.—Owing to these reasons, the capital cost of plant can be reduced to a minimum.
6.—Gas regulation is practically unnecessary, and, owing to the large production per retort, labour charges are enormously reduced.

Internal heating has been suggested on various occasions. As far back as 1890 Parker proposed to produce smokeless fuel by passing through the charge a stream of inert superheated gas. This process failed because the coal mass simply fused together, making an impenetrable barrier to the passage of the gas. Maclaurin also used internal heating in his retorts, while Nielsen adopts the system in his rotary retorting process. In both these cases producer gas is used as the heating medium, resulting in the production of a mixed gas of about 180 to 200 B.Th.U.

The authors, however, decided to use coal gas itself as the heating medium, and the surplus gas available from the plant therefore consists of coal gas of the usual quality and of about 500 B.Th.U. value. The primary essential for the success of an internally heated continuous vertical system is to prevent fusion of the charge in the retort, and the next to obtain a charge of uniformly sized lumps, so that the superheated gas passes freely through all parts of the charge. This end is attained by the briquetting process already outlined. The system finally worked-out can be summarized as follows.

The first essential in a domestic fuel is a low ash content. The coal is therefore first washed in a plant suited to the type of coal treated, so as to produce a material of as low an ash content as possible. The washed coal is then dried until it has a moisture content of not more than 3 p.ct. The drier usually recommended with the system is the "Static" drier made by Fuel Engineering, Ltd. Essentially it provides for the coal passing down in louvres, the heated gases being supplied at one side of the column and sucked through the coal by means of a fan. The discharge of the coal is regulated at the base. In the case of a bye-product installation of the character described, there is always available a big volume of waste gases at a temperature of about 200° C.; and these could be conducted into the drier, and thus allow the use of a separate furnace to be dispensed with.

The dried coal is then ground to the requisite size in a ball-mill consisting of a rotating steel drum charged with steel bullets or boiler punchings. For smokeless fuel production the coal is ground ordinarily to 30-mesh size. Generally speaking, this size will give the best product. The ground coal is then passed on to an ovoid press which is specially designed for heavy pressures. This press will give the equivalent of 8 to 14 tons per sq. in. area of briquettes. Arrangements are made so that no dust escapes from the plant, and the surplus material from the process is returned by a conveyor to be re-pressed. The briquettes leaving the press are hard and strong enough to be passed directly into the retort.

In a plate accompanying the paper, four retorts are shown, each of them having a capacity of 250 tons per day. Charging into the retorts is automatic and continuous, and discharging is also automatic and continuous. The retort consists essentially of a vertical cylindrical chamber lined internally with firebrick surrounded by heat insulating material, and this again is surrounded with cylindrical gas-tight steel plates. The retort is equipped with two regenerators. These are of the usual type, and are filled with chequer bricks. They are used alternately in the usual way, one generator being heated while the other is being employed for heating-up the gas used as a heating medium. Heating of the regenerator is performed by gas which has been freed from tar, ammonia, and bye-products. This gas is burned at the bottom of the regenerator, and the products of combustion pass through the chequer bricks, raising the temperature to the required point. During this period the regenerator is open to the chimney.

When the desired temperature has been attained, the chimney damper is closed, the gas and air supply to the burners is shut off, and the communication damper to the retort opened. Communication is thus made with the gas-main. Coal gas is passed through the regenerator, becoming heated in its passage, and goes directly into the retort. The sensible heat acquired by the gas in its passage through the regenerator is imparted to the coal, carbonizing the charge, and reducing the volatile content to the point required. During this period the other regenerator is being heated-up, the various valves, dampers, &c., being altered so as to reverse the passage of gas, air, and products of combustion simultaneously with the first regenerator. There are no engineering or mechanical difficulties to be faced in this system, which for all practical purposes can be compared with a blast furnace equipped with regenerators; but instead of the regenerative stoves being used for heating air, as customary in blast-furnace practice, they are in this case used for heating inert gas.

The capacity of the retort can also be realized from a consideration of blast-furnace practice. Many modern blast furnaces have a capacity of 4000 tons of pig iron per week. This means that 5000 tons of coke and 15,000 tons of ore and limestone have to be passed through. For all practical purposes the bulk of the coke can be regarded as passing through unchanged until it reaches the region of the tuyères, where it meets the oxygen for combustion. Assuming that a briquette could be made to withstand the pressure in its passage through the retort, there seems to be no reason whatever why single retorts should not be built with a capacity of 1000 tons per day, and these be used either for the production of blast-furnace coke or domestic fuel, whichever is desirable.

The possibility of cost reduction in coke manufacture can therefore be easily realized. With large plants of the capacity described, capital and labour costs can be reduced to a point considerably lower than in any existing carbonizing system, while the scientists' dream of doing away entirely with the use of raw coal becomes, for the first time, an ideal which is within the scope of practical politics.

Economics of Combined Briquetting and Carbonizing Processes.

The main question is, Will it pay? A number of factors are involved in this. The price of raw coal to the plant, cost of washing, value of the fuel at plant, market value of bye-products—all these have to be taken into consideration, and they will vary with the locality. The actual working costs, however, of the process

can be calculated with a fair degree of accuracy. These costs can be divided into two main classes:

1.—Preliminary treatment costs—drying, grinding, briquetting.
2.—Carbonizing costs.

Costs of Preliminary Treatment.

These will be common to all systems—whether for gas-works, coke-ovens, or internally heated retorts. It is assumed that the coal is delivered to the plant washed by any suitable means, so that the ash content is reduced to a minimum.

Drying Charges.—These are not serious. Washed coal to the plant can be taken as averaging from 10 to 14 p.ct. of moisture, and to allow of its being ground to a suitable degree of sub-division it is necessary to reduce this to below 3 p.ct. The fuel expenditure to dry the coal will not be more than 2½ p.ct., but even this is not necessary as a rule. In every big carbonizing plant there is always a large quantity of waste gases available at a temperature of 200° to 300° C., and these can be passed through the drier on their way to the chimney. The remaining items—wear and tear, labour, and capital charges—are very low in the system advocated, and are included in the subsequent figures.

Grinding.—This is the biggest item in the cost-sheets. The power consumption of the grinding plant will amount to approximately 8 to 10 H.P.-hours per ton. In the subsequent estimate 10 H.P.-hours are allowed, at a cost of ¾d. per H.P.-hour. This figure is based on grinding the bulk of the coal through a 30-mesh size. Labour and wear and tear are included below in the joint estimate.

Briquetting.—The power consumption of the briquetting press will be 5 H.P.-hours per ton.

Labour.—The whole plant is practically automatic, and can be run with very little attention when once the necessary adjustments have been effected, and a labour charge of 6d. per ton on a 250 tons a day plant is ample.

Wear and Tear.—This is the only uncertain item. Wear and tear charges on the grinding and drying plant will be very low, and the only uncertain item is that of the briquetting plant. This will be designed and built of such materials as to reduce renewal and replacements charge to a minimum; but to be on the safe side, a figure of 1s. 4d. per ton is allowed.

Capital Charges.—The capital cost of a preliminary drying, grinding, and briquetting plant complete with necessary coal-handling plant, conveyors, &c., will be from £50 to £70 per ton per day capacity, depending on the size of the plant. Taking the higher figure, and allowing 10 p.ct. depreciation and 5 p.ct. interest on capital, the capital charges per ton of coal treated will amount to approximately 9d. per ton.

The following figures summarize the preliminary charges:

	s.	d.
10 H.P.-hours per ton for grinding, at ¾d. per H.P.-hour. .	0	7½
5 H.P.-hours per ton for briquetting, at ¾d. per H.P.-hour .	0	3¾
Labour	0	6
Wear and tear	1	4
Depreciation and interest	0	9
	3	6

Carbonizing Cost: Internally Heated Retort.

Labour charges will be very low. Charging and discharging is automatic, and gas regulation is reduced to a minimum. Labour and supervision should not amount to more than 1s. per ton on a plant of 250 tons per day capacity.

Capital Charges.—The capital cost of an internally heated retort with bye-product plant for a unit of 250 tons a day capacity will be approximately £60,000. [This figure does not include the preliminary briquetting plant already dealt with.] Capital charges on this figure at 10 p.ct. will be approximately 2s. 6d. per ton.

Wear and Tear, Power, Water, Steam, Stores, &c.—Wear and tear will be extremely low. Power will only be required for elevating the coal to the retorts and for operating the charging and discharging mechanism. A figure of 1s. 6d. per ton is probably sufficient to cover all these items.

The carbonizing charges, therefore, amount to a total of 5s. per ton, making a total charge on the carbonizing system of approximately 8s. 6d. per ton—a figure which compares very favourably with existing carbonizing systems, and is considerably lower than the working costs of coke-oven plants erected subsequent to 1916. To this figure must be added the cost of coal, while deductions must be made in the usual way for the value of the bye-products.

Detailed figures are not given for these items, as they vary according to the locality and according to market conditions, while the yields vary with different coals. From the above data, however, it will be a fairly easy matter to calculate the commercial possibilities of the process in any particular area or for any particular coal.

The processes outlined may seem in some respects to be a radical departure from existing practice. The idea of incurring a heavy preliminary charge in treating coal prior to carbonization may, perhaps, not appear attractive at first sight; but even in normal carbonizing practice the resulting economies of working are so great that these charges are to a large extent repaid, while the other advantages mentioned in respect to the quality of the fuel, increased yield of bye-products, &c., are so considerable that the process is worthy of the very serious attention of the fuel technologist.

Finally, preliminary briquetting and subsequent carbonization offer a solution of many of the more difficult problems facing British coalowners to-day. In many cases it renders possible the use of coals which have in past times been almost unsaleable. Many non-coking coals, for example, can, by preliminary briquetting be converted into an excellent coke or domestic fuel. Non-coking coals of the Derbyshire and Nottinghamshire coalfields have been converted into excellent coke in this way. Many South Wales steam smalls can be briquetted without the addition of coke breeze, and produce a furnace coke of extremely high quality. Low-grade coking smalls of the type of Yorkshire smudge can further be converted into domestic or industrial fuel, while the problem of utilizing the South Crop coals of the South Wales coalfield is appreciably brought nearer to an economic solution.

The process is not an infallible one. Many coals exist which are extremely difficult to treat, and research is continuously being carried on with a view to devising schemes to deal with these; but sufficient has been done to show that the proposal of suitable preliminary treatment prior to carbonization is one which will in the near future have to be taken very seriously into consideration, not only by the mining industry, but by the iron and steel, the gas, and other great industries which are primarily dependent upon coal as the basis of their economic existence.

SMOKELESS METHODS IN GLASGOW HOUSING SCHEMES.

[A Paper read at the Congress of the Royal Sanitary Institute at Bournemouth, July 24 to 29.]

The following interesting contribution was made by Councillor WILLIAM B. SMITH, O.B.E., of Glasgow, who described what has been done in that city to secure smokeless methods in housing schemes.

The Corporation, he said, set out to build 57,000 houses; and up to date they have finished, or are in process of building, 4025. All the houses are lighted by electricity. In every house a gas-cooker and a gas wash-boiler are installed in the scullery, and gas-piping is taken in one bed-room to the coal grate in case a gas-fire is wanted; but in the living-room a coal-burning register grate, fitted with a boiler at the back to supply hot water, and a coal-fire in each bedroom, are provided. The disadvantages of this arrangement are that to get hot water the occupier must light the living-room fire, even when the room does not require to be warmed. Even in midsummer hot water is required for baths, washing dishes, &c., so a fire must be lighted; but there is no way of preventing the heat from the open fire coming into the room as well. Had a modern form of coke-boiler been provided, while heating the water it could be used as an open fire to warm the room, or in warm weather be closed-up so that much less heat would radiate into the room; and the coke-boiler would entail far less labour than the register grate, as it might only require charging twice a day. Money would be saved, as coke is cheaper than coal. Putting in a coal-fire and leading a gas-pipe to it is perpetuating the difficulty of adapting old conditions to new. It involves the cost of the fireplace, breast, and chimney stack necessary for coal, the cost of removing the coal-fire grate and of fitting the gas-fire, and the disadvantage of the chimney not being as suitable and safe for gas as a proper gas fireplace and flue would be.

I know one house in which in neither of the two bedrooms could the fire be lit, as the smoke was blown down into the room. The coal-fires had to be dispensed with, and electric radiators put in; but as electricity had only been installed for lighting, no plugs had been provided, which also had to be fitted. In one area where there is a group of 126 houses that have only been occupied for about a year, already in fifteen the occupiers have had electric cookers installed, though they have to pay for them a rent of £2 per year and 1d. per unit for the current used. In other cases quite a number have had gas-fires put into the bedrooms, not only in one bedroom where a gas-pipe was lead to the fireplace, but in many cases into the other bedroom which has no provision for gas, where the floorboards had to be lifted and the walls broken through to instal the gas-fire.

In April, 1921, the Electricity Department made a suggestion for two groups of houses—458 houses in Craigton Area and 1502 in Mosspark Area—that one area should be all electric and the other all gas. The Gas Department approved of this scheme. In every house there would be in the living-room the coal-fired register grate with boiler, as provided in all houses in other areas, to warm the living-room and provide the general hot water supply, In the electric-group houses there would be an electric cooker. wash-boiler, kettle, radiator for parlour, and two radiators for three bedrooms. The cost of this installation would have been about £13 more than the equipment of the usual type of house, but the saving in construction owing to the absence of fireplaces, chimneys, &c., would be about £40—a net saving in capital outlay of £27. The occupier of a five-apartment house was to pay a fixed charge of £5 4s. per annum *plus* ½d. per unit for all current used, including that for lighting, estimated to average about 3500 units per annum—just a little under a flat rate

of 1d. per unit. In the gas-group house there would be a cooker, wash-boiler, fires in every room, a hot-water circulator (as auxiliary to the coal-fired grate boiler), and one point for an iron. The lighting would be done by gas. The extra cost of this installation would be about £10, but this could have been saved in the building construction cost.

But the Housing Committee refused to adopt either scheme, and are putting in electric mains for lighting and gas-mains for cooking through 7½ miles of streets in the Mosspark Area alone, where there are only ten to twelve houses per acre; and they are paying the Gas Department a subsidy of £20,000 and the Electricity Department £10,000 towards their capital outlay on mains, because the revenue would not pay the interest, &c., on two sets of mains—one for gas and the other for electricity to each house. I give this as an example of what all housing authorities ought to avoid.

What I suggest now, as one model scheme for a new housing area, would be in each house: 1.—One of the new-type boilers, burning coke, capable of being used as a closed-up or open fire at will, to warm the living-room and to supply the hot water required for all purposes except cooking. The flue from this boiler should not be of so large a diameter as the flues and chimneys usually put in for ordinary coal-grates, as the better draught makes this unnecessary, and a flue not any wider than actually required is less liable to down-draughts. 2.—A wash-boiler in the scullery, set just through the wall and back-to-back with the coke boiler, supplied with hot water from this boiler, and with a gas-burner under it to raise the hot water up to boiling-point when required, the flue from it going into the flue of the boiler. 3.—In the scullery also a gas-cooker, provided with a canopy and pipe into the boiler flue, to carry off all products of combustion, both from the oven and boiling-rings. 4.—In each bedroom there should be a good single gas-fire, with a flue of long narrow section in the special bricks forming the wall, opening out to the air under the eaves. This brick should also carry a ventilating flue. This would save money in construction. The lighting would also be done by gas.

Another scheme would be the same for the living-room and hot water supply, but the cooker and wash-boiler would be heated electrically, and an electric radiator would be provided in each bedroom, or a plug provided in each room to which a radiator could be connected. This would also be cheaper in construction, as only the one flue and chimney—for the coke-boiler—would be required. A simple form of ventilator would be advisable, as open windows sometimes might not be available in stormy weather. The choice of gas or electricity for an area would depend on local conditions of supply, or what was expected to be most in demand.

In some places the individual-unit central heating system might be preferred. In blocks of tenements, where a large number of houses are within a small area, a supply of hot water from a central source should be quite economical, and would certainly be most convenient for the occupier of the house, Used also to warm the house, and with gas or electricity for cooking, the work of the house would be reduced to the absolute minimum.

In a house, of all the methods available for heating water, a coke-boiler is cheapest. The heat of combustion is in direct contact with the surface of the boiler, and there is no soot deposited on to the boiler to diminish the conduction of heat. Then the fact that gas and electricity need not be turned-on till the heat is actually required, and can be turned-off when it is not, makes their cost compare favourably with a coal-fire, which often has to be lit long before it is required, and remains in long after it is done with. Therefore, though coal may cost less per therm—*i.e.*, may contain more B.Th.U. in a shilling's worth—yet in its application the loss of B.Th.U. is so great, so small a proportion is actually effectively applied to the work being done, that the loss of heat outweighs the apparently lower cost. In the case of gas, though it costs more per therm, there is less loss, especially in roasting and baking, as the combustion takes place in the oven itself; and, in the case of electricity, not only is the heat released in the oven, but the oven itself is sealed up, so that the heat loss is extremely small and the loss of weight of food by evaporation is much less than in a coal-heated oven.

Alcohol as Motor Fuel.—An interim report of the Engineering Sub-Committee of the Empire Motor Fuels Committee of the Imperial Motor Transport Council deals with an investigation into the behaviour of alcohol in internal combustion engines (95 volumes p.ct. alcohol). Summarizing the results of the experiments, the Committee say it has been definitely proved that alcohol can be applied from the low compression employed on paraffin engines up to a far higher compression than can be used on any petrol. That the thermal efficiency obtainable with alcohol is higher than with petrol or benzole. That under all conditions of throttle or mixture, alcohol requires the spark more advanced than is the case with petrol or benzole, and much more advanced with the weak mixtures. That there was no evidence at any piston speed attained in the engine that the rate of combustion of alcohol under the conditions obtaining was too slow to obtain the maximum effect. That there were no evidences of corrosion in the engine. That the power output and efficiency are increased by low temperature of the circulating water. That supplying heat to the carburettor reduces the power output, but slightly increases the thermal efficiency. That increase in the water content up to 10 volumes p.ct. is an advantage—particularly in very high compression engines.

THE VALUE OF CLEAN FRESH AIR.

[From a Lecture at the Congress of the Royal Sanitary Institute at Bournemouth, July 24 to 29.]

In the course of a lecture on "The Value of Clean Fresh Air," Dr. Leonard Hill, F.R.S., said that the damage done by smoke to property in Manchester and Salford has been estimated at £1,000,000 annually, or about £1 per head of population. A similar estimate for London is £4,000,000. The smoke nuisance regarded as a preventible source of damage to buildings, furniture, fabrics, plant life, and human vitality has been put at £50,000,000 a year; but, taking into account human happiness, health, and working power, it is incalculable, and at any rate very large. In addition, there is a prodigious loss of valuable bye-products, which under scientific control might be saved.

These bye-products can be saved by the distillation of coal in gas-works, and the utilization of gas for lighting and heating and of coke or other smokeless fuel for heating and for raising electric power and light and steam power. It is estimated that over 90 p.ct. of the fuel value of the coal is at present wasted. Only 8 p.ct. of the fuel value of the coal is obtained as power in electric power stations, and only ¼ p.ct. of the fuel value of the coal used to produce it is converted into electric light. In contrast to such inefficiency, the luminous efficiency of the glow-worm or firefly is 100 p.ct. By carbonization of coal at gas-works and the use of gas, coke, and bye-products, some 25 p.ct. of the thermal energy of the coal can be secured. The modern radiant-heat gas-fire gives us some 15 p.ct. of the thermal energy of the coal used to produce it, and the efficiency of the gas-boiler is almost as high.

The coke used to generate electricity will give us another 8 p.ct. The bye-products—such as tar, ammonium sulphate, &c.—are estimated to give 6 p.ct. By turning coke into electric power and supplying this for light and gas for heat to every house, home industries can be revived, and life made immensely happier in garden cities. By using gas, coke, and smokeless fuel in place of raw coal, we can clean the skies and conserve the national coal stores for foreign barter and future use. With the same output we shall have two or three times as much coal available. What a prodigious folly to continue the waste as at present!

Turn to the effect of smoke on health and happiness. Smoke covers people and their houses with dirt, causing an enormous expenditure of human energy in cleaning, painting and re-decorating of buildings, and washing of clothes. Smoke fogs delay the transport of goods and people, with all the annoyance and loss of time and money therefrom. The deposit of soot at Southwark—39 tons per month per square mile—must be compared with that in a country district like Malvern, where it is only 7 tons. Dr. Owens' experiments show that the pollution from coal smoke in London begins at the time of lighting the domestic fires. When the fires become hot it is better—at night it is nearly as small as in the country. If the newly-lit fire could by some means be rushed to a red heat, there would be much less smoke and fog. A few years ago the people of Manchester were estimated to receive 50 p.ct. less active rays of sunlight than the people in Didsbury, 4 miles away. Leeds, it is calculated, receives 40 p.ct. less daylight than its suburbs.

The quantity of soot emitted by domestic fires is estimated by Prof. W. A. Bone at 3 millions, and that from factory furnaces at 6 millions—in all nearly 10 million tons a year. The domestic soot is more tarry, causes more fogs, and is more pernicious to our lungs than the blue smoke of factories. The choking of the leaves by tarry matter and sulphur acids in the smoke destroys vegetation and lessens the pleasure and health derived from the cultivation of gardens and the use and enjoyment of public parks. The destruction of vegetation is of very great importance to health, not only from the æsthetic side, but from the fact that fresh green foods and the milk of cows fed on such are protective foods containing the vitamines essential for health, growth, and breeding. The want of these is one of the great causes of malnutrition, disease, infertility, and unhappiness in our big cities. Smoke intensifies the natural white mists, and cuts off not only the light but the heat of the sun, and hinders evaporation of water, thus increasing the gloom and cold humidity of the climate, which impels people indoors and to sedentary occupations and pleasures, in place of healthy exercise out of doors. The deleterious effects so produced are vastly more important than the blackening of the lungs by inhaled soot or their irritation by sulphur acids.

Co-Partnership Dinner.—It has, says the South Metropolitan Gas Company's "Co-Partnership Journal," been decided this year to revive the co-partnership dinner, which was so pleasant an annual gathering in the ten years preceding the outbreak of war. The eleventh dinner will therefore take place on Saturday, Sept. 9, at the Crystal Palace.

"Labour Policy False and True."—A book bearing this title will shortly be published by Sir Lynden Macassey, K.B.E., LL.D., D.Sc., Assoc.Inst.C.E. Sir Lynden has had a large experience of labour questions in his official capacity; and the table of contents of the work from his brain and pen satisfies us that the volume, when issued from the press, will appeal to all concerned in industrial labour.

A NEW GAS QUALITY INDICATOR.

By A. GREBEL.

[From a Paper read at the Annual Meeting of the Société Technique du Gaz.]

In introducing to the French gas industry the instrument that he has invented in collaboration with M. Velter, M. Grebel reviewed at some length the previous efforts made to satisfy changing exigencies with a reliable yet workaday indicator and controller. He touched on jet photometers (wrongly named, he maintains), and argued the relations of density, calorific power, luminosity, and flame propagation.

Until the present century, he says, the objects of gas engineers were, first, to supply at a normal pressure (or below it) gas burning with a luminous flame of suitable length, and without smoke at the burners then in use, and, secondly, to satisfy the existing regulations as to candle power. How better to supervise the supply than to observe the flame from a simple burner? For the only concern of consumers was to regulate their taps so as to avoid a smoky flame and one showing above their shades.

About 1900, Giroud, in view of the development of the Auer incandescent burner, foresaw that his "gas-tester" would not long answer the industry's needs; and in 1903 he brought-out an "indicator showing the density of the lighting and calorific powers of gas"—an appliance which cost about 1100 frs. The valve of his earlier instrument, which passed the gas either to a flat-flame burner or to a measuring holder, was replaced by a three-way cock. This directed the gas also to a small bunsen burner which functioned under a pressure of 10 mm., and the flame of which warmed the bulb of a mercury thermometer. By the aid of an electrically controlled clock, the time was recorded which the mercury took to rise from 50° C. (the starting-point adopted) to 250° C.; and, thereafter, by means of the small test holder, the volume of gas consumed was recorded, and a table prepared showing the calorific power.

After a brief reference to the next stage of gas-recording development—the continuous recording calorimeter—M. Grebel states that the designers of the instrument under consideration became convinced that a modern controller must do something more than indicate merely the intrinsic properties of gas. What, he asks, are the present-day objects of the gas engineer? Primarily, to distribute gas of sufficiently constant quality to suit the various bunsen burners used in heating and lighting apparatus, and also such flat-flame burners as still exist; and, secondly, to keep within current regulations as to calorific power. Already certain engineers, among whom is M. Savary, have considered the possibility of testing gas by observing its behaviour in modern burners. The best method of procedure consists in using two bunsens—the flame in one being slightly aerated, that in the other moderately so; for in the majority of modern heating burners care has to be taken to admit sufficient primary air to suppress the luminosity of the flame, and at the same time not to allow more than the mixture can support without lighting back. Theoretically, of course, the amount of primary air in the case of industrial burners should approximate to the "comburivorous power" (the oxygen carrying capacity of the gas); but with the low pressures found as a rule at consumers' appliances, such regulation may easily fail in practice. Above all, one must have regard to the speed of propagation of flame; and the height of the interior cone of a bunsen flame is exactly inversely proportional to this speed. It has already been established that, when one adds water gas, or hydrocarbons, or inerts to coal gas, the height of the cone in the flame increases proportionally; whereas the introduction into the gas of oxygen, in the form (say) of carbon monoxide or air, has the opposite effect. Perhaps some explanation of these "interior cones" should be given.

FLAME STRUCTURE AND BEHAVIOUR.

Consider the form of a bunsen flame of mixed gas, and the effect of gradually opening more and more the primary air inlet. It will be observed that the complex flame structure alters in proportion as the injected air increases.

(1) To start with, the flame is very long and very bright; and combustion is only complete towards its base.

(2) As primary air is admitted, the flame momentarily lengthens, and then falls again, and loses some of its brilliance. The exterior zone of the flame, which in daylight is practically colourless and appears purply-blue in the dark, swells out, and within there forms a luminous tongue above which is a less luminous streak.

(3) This cone becomes less and less brilliant, and finally vanishes; and then the bulk of the flame loses its luminosity, but retains a short interior luminous crown round a bluish cone. Such behaviour of the flame probably indicates the formation of methane by dissociation of the hydrocarbons. This stage of combustion has been selected as one criterion of gas quality in the Grebel-Velter indicator.

(4) The flame still subsides; and the luminous tongue approaches the burner head, and fades.

(5) There forms a blue cone which is clearly distinguishable and the summit of which is rounded. This stage probably indicates the formation of carbon monoxide at the surface of the blue cone; and this has been selected as the other criterion of quality.

(6) The shortening of the flame proceeds more slowly. The blue cone narrows, becomes greenish blue, and is surmounted by a tongue similar to that noticed in stage 2, but very unsteady. The cone finally starts flickering.

(7) The cone next becomes green, and is steadier; but further aeration restores the flickering. This stage might have been taken as an index point, as it must correspond to the oxidation of the hydrogen at the surface of the cone; but the variation of the crest is not evident enough to be observed by an inexperienced attendant.

(8) On further reduction of the flame, the green cone loses its shape, and bubbles; its central tongue (as in the case of stage 6) gradually disappearing until it merges into fleeciness and green globules at the mouth of the burner.

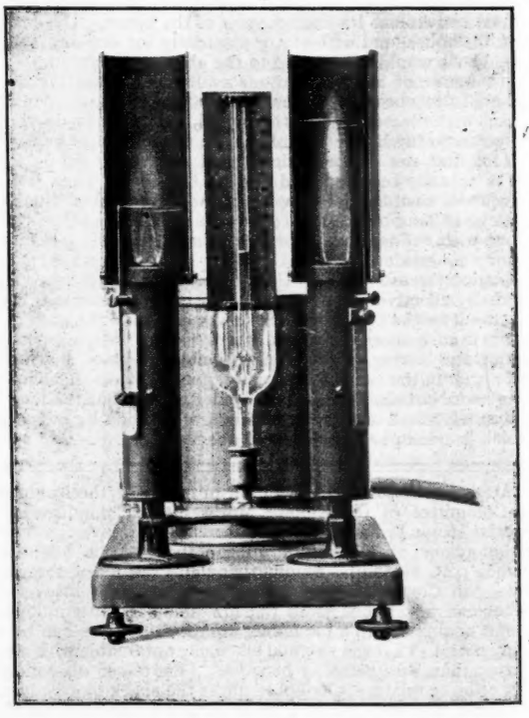
(9) The globules then diminish, and turn to violet—a stage which shows that the quantity of primary air in the mixture has passed the standard of comburivity, and that the flame is over-oxidized; carbon dioxide being in all probability formed at the surface of the globules. Finally, even if the pressure is high, the flame disappears into the burner tube.

To sum-up, the interior zone of a bunsen flame is surrounded by a purply-blue zone, in which takes place the combustion of water gas created in the former. When a small quantity of primary air is admitted, the interior zone is bright, while the surrounding zone is of smaller dimensions, and not luminous; and the admission of much primary air causes the interior zone to be comparatively small in volume, and to vary in colour from blue, through green, to violet. The variations in height of this interior zone can be represented graphically; and by plotting, as abscissæ, the volume of primary air admitted for a constant consumption of gas and, as ordinates, the height of the interior zones, a curve is obtained in the form of a parabola. The tangent of that portion of the curve relating to the blue cone stage (taken as the first criterion) is practically the same as that relating to the green cone, while it is approximately half the tangent of that portion relating to the luminous tongue stage, taken as the second criterion. One is therefore at liberty, in order to follow the velocity of flame propagation, to make observation of the more distinct variations in height of the luminous tongue and of the blue cone in place of variations in the green cone, which are less easy to measure.

Such is the principle of the Grebel-Velter indicator.

DESCRIPTION OF THE "G.V." INDICATOR.

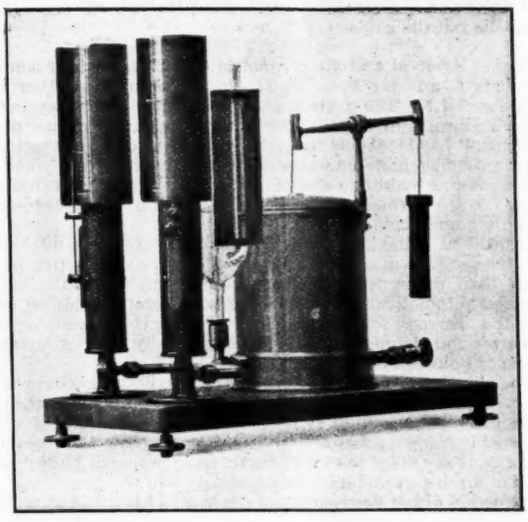
The Grebel-Velter indicator, which costs 400 frs. complete, consists essentially of (1) a regulator capable of fine adjustment and a manometer, and (2) a pair of burners with wire-gauze nozzles, suitable for a consumption of some 90 litres [3·2 c.ft.] an hour. The whole apparatus is mounted on a base furnished with levelling-screws. We reproduce two views of the indicator



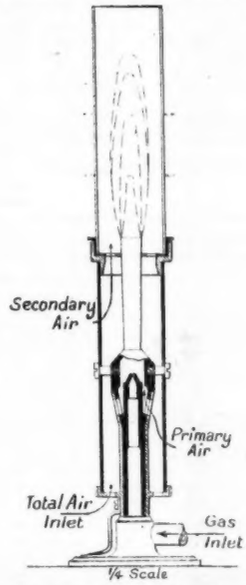
and a vertical section through one of the burners. The total air required by each burner enters an outside cylinder (with ample clearance beneath), which also supports a short glass chimney wherein the flame is free to develop; the air being induced partly by the gas-jet injection, and partly by the considerable draught set-up by combustion.

The general arrangement tends to rigidity of flame, even with a pressure as low as 30 mm. of water; and the burner is unaffected even by strong external draughts. The primary air regulator

consists of a conical fitting with triangular apertures; its rotation being effected by moving an indicating needle over a scale on the burner foot. A semi-circular, blackened hood behind the chimney,



and an "index"—a fine ring outside the glass—complete the appliance; the annular index, of which the function is to mark the summit of the interior cone of the flame, being fixed to a cursor sliding over a scale of millimetres. The whole is of strong construction, and, as will be seen, easy of manipulation.



Vertical Section through a Burner.

ARRANGEMENT OF THE FLAMES.

The left-hand burner is regulated, once and for all, so that the gas as supplied regularly burns in it with a bluish cone, and the index ring is set at the crest of this cone. In the right-hand burner the regulation should be such as to show a bluish cone surmounted by a luminous tongue 10 to 15 mm. in height, clearly defined and without an envelope of duller flame. This index should mark the crest of the luminous tongue.

It has been observed that with a normal gas of 4950 calories [556 B.Th.U.], the blue cone in the left-hand burner is 39 mm. high, and the primary air pointer is over the fourth division. In the right-hand burner the crest of the tongue is 76 mm. from the nozzle, and the pointer over the third division.

PRACTICE.

When the gas is enriched, the cones tend to rise and alter their shape; and they subside as the mixture weakens. On exactly measuring the variations on the index scales, it will be found that the right-hand point sinks practically twice as fast as the other, which facilitates the detection of but small variations of quality. Every works that uses the instrument should prepare a table or a curve, plotting cone heights against calorific power.

The indicator should serve to show, for example, the influence on gas of degrees of benzole-stripping and of the addition of various proportions of water gas; but up to the present, experiments have only been carried out with aeration, on which a start was made in view of the growing practice of revivification *in situ* and more drastic carbonization. The results of these aeration tests are tabulated below. They might also be presented graphically; and in practice a parabolic curve can be prepared relating to the various means of increasing or diminishing the thermal value of the gas. Calibration can easily be effected.

	Calorific Power. Calories.	Comburivorous Power. (Vol. of Air for Complete Combustion.)	Percentage Aeration.	Height or Characteristic of the Interior Cone.	
				Medium Aeration. No. 1.	Slight Aeration. No. 2.
0	4950	4·56	—	40 mm.	78 mm.
1			2	37 ,,	72 ,,
2			3	35 ,,	68 ,,
3			5	32 ,,	63 ,,
4	4603	4·17	7	29 ,,	57 ,,
5			10	25 ,,	Luminous tongue disappears.
6			15	15 ,, (Cone green, unsteady, and noisy.)	Blue cone as in Exp. 0 with No. 1 flame.
7	4108	3·61	20	Very small green cone.	Green cone.

CONCLUSION.

The author gave as his opinion that at a time when gas making was undergoing wide changes, and when the perfection of the bunsen burner and its application to every sort of heating was rapidly developing, the Grebel-Velter indicator would meet a pressing need. By noting the appearance of two gas-flames—one moderately, and the other but slightly, aerated—gas engineers would be able to keep continuous control over the fuel they distributed. Based in principle on an essential characteristic of combustible gases—the speed of flame propagation—by the measurement of the heights of the internal cones, the instrument, once calibrated, would show what modifications of composition were necessary to satisfy the consumers and to keep the product within the prescribed regulations of supply.

Carrying Bases for Oxide of Iron.

Consequent upon the high cost of pine planer shavings (which have hitherto in the United States been almost exclusively used for the purpose), an investigation has been made in the laboratory of the People's Gas Light and Coke Company, Chicago, to determine if possible what materials could be employed as substitutes, as a carrying base to give surface and fluffiness to purifying material. The tests were conducted to discover the amount of oxide that the various carrying materials used would retain per bushel. It was shown that pine planer shavings came first in this respect—retaining approximately 30 lbs. of oxide per bushel, corn-cobs 20 lbs., and wood chips 11 lbs. From this, says Mr. S. J. Modzikowski, it is apparent that a mixture of iron oxide and shavings is of much greater purifying capacity than is the case with the other materials mentioned, for the reason that a much greater volume of gas may be passed through the same stuff without removal from the purifier, thereby cheapening the cost of purification. Since, for instance, corn-cobs will retain one-third less oxide than shavings, a corn-cob mixture—assuming that mixtures of oxide with shavings and corn-cobs are both equally permeable to the gas, and that the contact between the oxide and gas is the same in both cases—will reduce the capacity of a purifying box so that 33 p.ct. less gas can be purified with a given volume of corn-cob material, using the same kind of oxide of iron. Results, however, obtained from a fouling test show that the assumption just referred to is not tenable. A fouling test made on a shavings mixture which had retained 30 lbs. of oxide per bushel showed that 5·566 lbs. of sulphur were absorbed per bushel of dry purifying material. A corn-cob mixture, on the other hand, which contained 20 lbs. of oxide per bushel showed 2·486 lbs. of sulphur absorbed per bushel of dry material. Thus, assuming the two mixtures to contain equal amounts of oxide per bushel, a corn-cob mixture would absorb approximately one-third less sulphuretted hydrogen than an equal volume of shavings mixture.

City and Guilds of London Prize Winners.

In last week's "JOURNAL" [p. 264] the names were given of the prize winners in the Final Gas Examinations. Winners of prizes in the other Grades were:

Gas Engineering.—Grayston, John, first prize Grade I., bronze medal.

Gas Supply.—Robinson, Harry Denbigh, first prize Grade I., bronze medal.

Gas Fitting.—Kiddle, William, first prize Grade II., bronze medal; Haine, Harry Thomas, second prize Grade II., bronze medal.

Selling Gas for Cooking.—"Service Folder Number 2" of the British Commercial Gas Association contains much matter which should prove of value to subscribers in pushing the sale of gas for cooking purposes. It, in fact, indicates two plans of campaign which may be run simultaneously or separately, as may be desired. The first is for selling to the consumer who does not use a gas-cooker, and the second for increasing gas consumption through existing appliances.

LOWE'S PLANT FOR THE MANUFACTURE OF BLUE WATER GAS IN CONJUNCTION WITH COAL GAS.

We have received from Mr. James Lowe, Engineer and Manager to the Auckland (N.Z.) Gas Company, Ltd., working results of his process for the manufacture of blue water gas in conjunction with coal gas, together with some photographs of the plant as erected at the gas-works there.

Mr. Lowe's invention is the subject of British patent No. 149,928, applied for in 1919. The invention relates to a plant, for the manufacture of blue water gas and producer gas, comprising twin generators or producers arranged so that blue water gas is made in one generator while the fire in the other generator is being blown-up or revivified with air; equal water-gas making and producer-gas making periods of time alternating in each generator, so that a continuous production of blue water gas and producer gas is kept up. The valves of the generators are adapted to be simultaneously operated, and may also be operated automatically. The invention is illustrated in the accompanying illustration (a reproduction of the patent specification drawing). Fig. 1 is a transverse sectional elevation through one unit of plant consisting of two generators or producers. Fig. 2 is a transverse sectional elevation through one generator. Fig. 3 is a transverse elevation showing valves and dampers, and also the flues in section. Fig. 4 is a sectional plan on a plane cutting the water gas and producer gas flues.

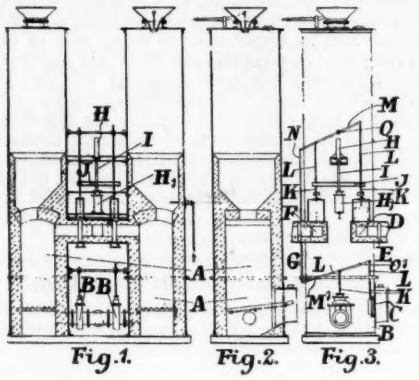


Fig. 1. Fig. 2. Fig. 3.

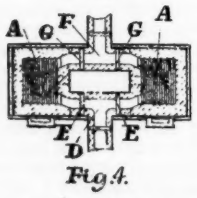


Fig. 4.

Combination of Water Gas and Coal Gas Plant.

The bricklined generators or producers A are provided with a flue or pipe F for conveying the water gas made during the gas-making periods to the retorts. This flue or pipe has valves or dampers G for the purpose of controlling the flow of gas from either generator. The producers are also provided with a flue or pipe D having therein valves or dampers E for conveying the producer gas made in the periods of revivification to the furnaces, or to any desired place. Each generator is provided with an air valve B and a steam valve C. The valves and dampers B, C, E, and G are connected together so that while the steam valve C and the water-gas damper G are open on a generator, the air valve B and the producer-gas damper E are closed on the same generator, but open on the other generator. The arrangement of change-over valves is not, however, *per se*, part of the invention claimed.

The valves and dampers B, C, E, and G may be connected in many different ways, by linkwork or gearing, and a particular mechanism for operating them is not claimed as part of the invention. Similarly, the force employed to actuate the mechanism controlling the movement of the dampers and valves may be derived from any source—manual, steam, compressed air, hydraulic, or electric power. One method of connecting the valves and dampers by linkwork, and applying hydraulic power for their operation, is shown in the specification, and is as follows: H and H_1 are hydraulic cylinders acting in opposition to each other on one piston rod I. These cylinders are connected to a hydraulic pressure valve (not shown), so that water under pressure is admitted into one cylinder while the other is open to exhaust. The piston rod I carries a crosshead J, which is connected to the damper rods of two diagonally opposite dampers—that is to say, the crosshead J is connected to the rod on the damper G of one generator and the rod of the damper E on the other generator.

Fig. 3 shows the linkwork connections to the valves and dampers on one generator; and the arrangement of connections on the other generator is exactly the same, except that the valves and dampers are in the opposite position on the other generator. The four rods K attached to the dampers and valves are connected to swinging levers M and M_1, pivoted at O and O_1, by four connecting rods L, and the swinging levers are coupled together by a coupling rod N. The connection between the linkwork system on one generator and that on the other is made by means of the crosshead J, which (as has already been said) is connected to a pair of diagonally opposite damper rods K. Thus, when the piston of the hydraulic cylinders takes a stroke, all valves and dampers are thrown from one position into the other—those which are open being closed, and *vice versa*.

Instead of using hydraulic cylinders, an attendant might operate the gear by means of a lever. Further, any motive power other than water might be used, and it might be arranged to operate automatically at pre-determined intervals, doing away with the necessity for an attendant. Exactly the same movement of valves and dampers might be obtained by different arrangements of linkwork or gearing.

The plant may be combined with an installation of gas-retorts for the carbonization of coal, so that blue water gas made in the blue water-gas plant is caused to pass through the gas-retorts in which the coal is being carbonized or is introduced into the stream of coal gas at any stage in the manufacturing process. The employment of a relief gasholder is unnecessary with this plant, and the introduction of hot newly-made water gas to town gas during the process of manufacture of the same is greatly facilitated.

WORKING RESULTS.

Duration of trial	18 days (May 1 to May 18 inclusive); but plant has been continuously in operation till the present date (June 20).
Period of blow	4½ minutes.
Period of gas making	4½ ,,
Grate area of each generator	16 sq. ft.
Coke used in generators	151·5 tons.
Coke recovered from ashes by forking	9 ,,
Coke saved in retort-furnaces by utilization of blow gases	24·5 ,,
Blast pressure in ash pits	5 in. W.G.
Pressure in producer-gas ducts (blow) close to generators	2 in. ,,
Pressure in water-gas ducts close to generators	2½ in. ,,
Steam pressure	120 lbs. per sq. in.
Weight of steam used indicated by "Kent" steam-meter	978 lbs. per hour.

Analysis of Water Gas (Average of Three Tests).

	Per Cent.	
CO_2	— 6·6	Cal. value per cubic foot = 326 B.Th.U.
O	— 0·2	
CO	— 34·2	
H	— 47·6	
CH_4	— 5·0	
C_nH_m	— 1·9	
N	— 4·5	

Partial Analysis of Blow Gas (Average of Three Tests).

	Per Cent.
CO_2	— 15·25
O	— 9·5
CO	— 10·5

Gas made during trial (coal and water gas) as registered by station meters	= 52,465,000 c.ft.
Coal carbonized	= 3220·56 tons
Gas made per ton	= 16,290 c.ft.
Calorific value average	= 526 B.Th.U.

Yield in therms per ton of coal carbonized, 85·6854.

Coal mixture used:

Maitland, N.S.W.	⅓ large	⅔ small	45 p.ct.
Westport, N.Z.	⅓ unscreened,	⅔ small	45 ,,
Lignite slack, Waikato, N.Z.			10 ,,

Yield of above mixture as straight coal gas from long experience
= 73·8 therms per ton.
(12,767 c.ft. of cal. value, 578 B.Th.U. per c.ft.)

Gain in therms per ton due to water gas
= 85·6854 − 73·8
= 11·4854 therms per ton.

Total gain in therms due to water gas during trial,
3220·56 × 11·4854
= 36,989·42

Volume of water gas made in cubic feet during trial,
$$= \frac{36,989·42 \times 100,000}{326}$$
= 11,346,500 c.ft.

Percentage of water gas in mixed gases, 21·6.
Volume of water gas per ton of coal carbonized, 3523 c.ft.
Amount of water gas made per day (19 working hours) = 630,360 c.ft.
Amount of water gas made per hour = 33,177 c.ft.
Steam used per 1000 c.ft. water gas, 29·5 lbs.

Coke used in generators (gross)		151·5 tons.
Less (1) recovered from ashes by forking	9 tons	
(2) saved in retort-furnaces by use of blow gases	24·5 ,,	
		33·5 ,,
		Net 118 ,,

Net coke used, 118 tons.
Coke used per 1000 c.ft. of water gas made,
Gross, 29·9 lbs.
Net, 23·3 ,,

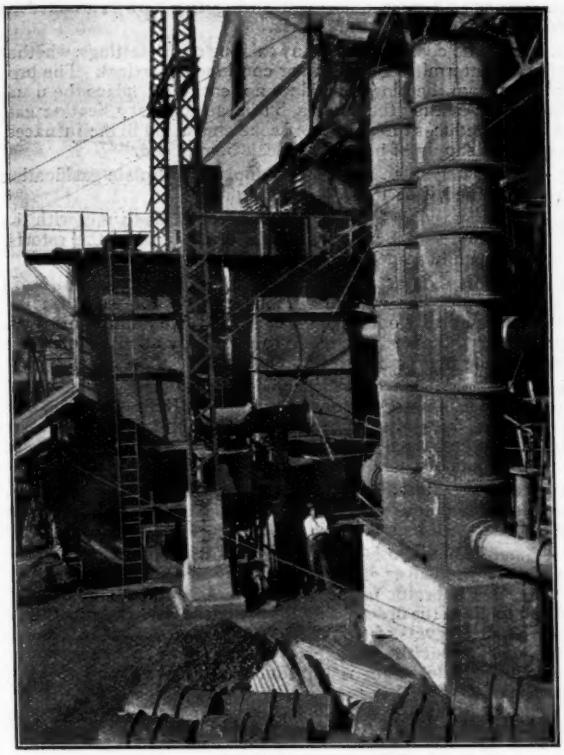


Fig. 1.

View of the plant from the water-gas side. The lattice standards carrying the telpher track in course of erection are shown; but at present all coke for the plant is tipped from the temporary ropeway on to the coke-shoot, and shovelled into the plant through the charging-hoppers. The dust chamber in the water-gas main is seen beside the concreted base of the standard. The water gas in this case being combined with an installation of horizontal retorts, after leaving the dust chamber, passes through a water seal into the condensers prior to mixing with the coal gas at the inlet to the condensers.

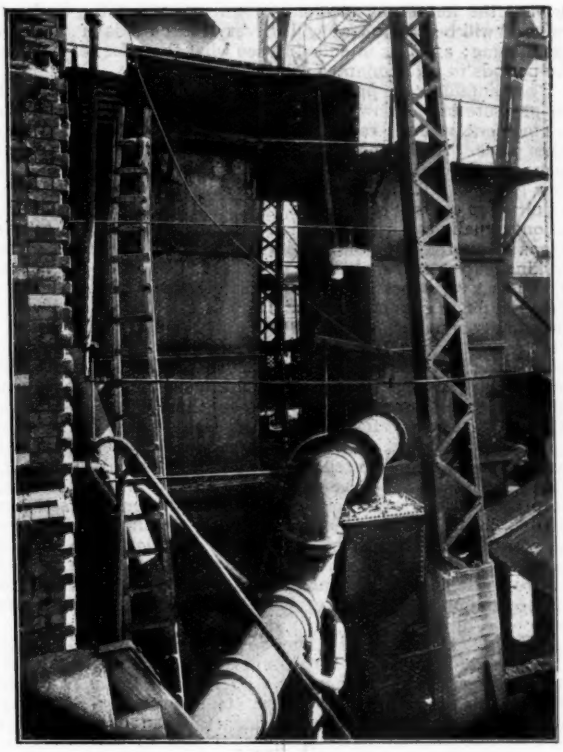


Fig. 2.

View of the plant from the blow-gas side. The firebrick lined flue or pipe can be seen as it leaves the dust chamber on its way to the retort-bench. The working valves and dampers and the hydraulic cylinders actuating the same may also be discerned between the generators. The flue is a 15-in. cast-iron pipe lined with firebrick tiles, 1½ in. thick. Future installations will have a thicker firebrick lining enclosed in steel pipes.

Efficiency of water-gas manufacture, neglecting power required to drive the blower (which in Mr. Lowe's opinion is not a factor in the thermal efficiency at all, but is an operating cost), but taking into account the total heat of the steam used (not the fuel in the boilers to produce steam)—

$$\text{Efficiency} = \frac{\text{Heat in water gas}}{\text{Heat in net coke used and heat in steam}}$$

$$= \frac{1000 \times 326}{23{\cdot}3 \times 13{,}800 + 29{\cdot}5 \times 1160}$$

$$= 91{\cdot}6 \text{ p.ct.}$$

As this plant is combined with a horizontal retort installation, the gas after being partially cooled mixes with the coal gas at the inlet to the condensers, and thus the sensible heat of the hot water gas is lost. Were the plant combined with vertical retorts, the sensible heat (except that lost by radiation from the brick-lined flue) would be carried to the retorts and used, and thus the efficiency would be further raised. It is also probable that the percentage of CO_2 present in the water gas would be reduced by passing it through the vertical coal-gas retorts.

REMARKS.

The CO_2 content of the water gas was continuously recorded on a "W.R." CO_2 recorder. The supply was taken from the water-gas flue close to the generator; the gas being led through a small coke scrubber fed with fresh water, and subsequently through an oxide purifier into a gasholder (15 in. diameter) which supplied the recorder. The reading given by the recorder was therefore an average one for the time being, and there were no abrupt variations. The maximum percentage of CO_2 shown by the recorder was 8 p.ct., and the minimum was 4½ p.ct. Prior to the test, it was found that, by reducing the periods of blow and gas making from 5½ to 4½ minutes, the CO_2 content as shown by the recorder was reduced. By means of a belt on a stepped cone

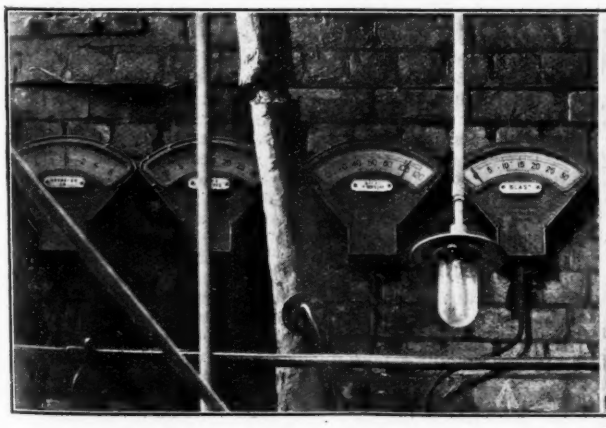


Fig. 3.

View of the producer (blow) gas, water gas, steam-pressure and blast-gauges. The steam-pipe supplying the plant is shown, and the V-orifice of the Kent steam-meter may be seen on the left-hand branch from the steam-pipe. The dial of the steam-meter is situated below the orifice fitting. At the time the photo was taken, the plant was being ashed out; consequently, the gas and air pressures are at zero.

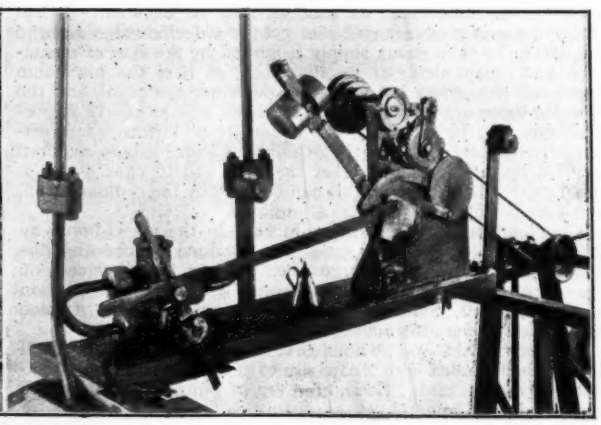


Fig. 4.

The hydraulic valve actuating the hydraulic cylinders. This is placed in the exhauster-house, and is a considerable distance away from the plant. As one cylinder is a constant pressure cylinder, only one pipe requires to be taken from this valve to the plant. A light belt-drive from a continuously revolving shaft actuates the plant, and, by moving the belt on the stepped cone, the periods of gas making can be varied.

driving the automatic mechanism for operating the hydraulic valve, it will be possible at will to vary the periods of blow and gas making; and it is intended to see what the effect of reducing the periods to three minutes will be.

By maintaining the pressure in the water-gas flue slightly above the pressure in the blow-gas flue, a scavenging action is caused at the moment when a reversal of the working valves or dampers takes place. At this moment all valves and dampers are partially open, and the water-gas sweeps through the generators into the blow-gas flue. This action should be of advantage in reducing the nitrogen content of the water gas, and that such scavenging action actually takes place is proved by holding a torch to a jet of gas taken from the blow-gas flue. When the reversal of the working valves takes place, the quality of the blow gas is seen to improve very greatly, but immediately the change has taken place the flame goes out. The quality of the blow gas, however, gradually gets better, and it can be ignited as the blow goes on.

In November, 1921, when the plant was first put into operation, the working valves or dampers on the gas flues had parallel faces, and the plant worked quite satisfactorily so long as there was only a slight pressure difference between the water-gas and blow-gas flues. But it was found that if the pressure was increased on one side or the other, leakage took place into the other flue; and it was therefore decided to replace the parallel-faced dampers with wedge-shaped ones. These were made and put in last April, and the plant was restarted on the 25th of that month. It is now possible considerably to increase the pressure in the water-gas flue without any appreciable leakage taking place. In view of the intention to instal future plants in conjunction with vertical retorts, it was deemed advisable to make this change. The automatic operation of the working valves and dampers has gone on for months, and has never given any trouble.

An examination of the working dampers of the water-gas side of the generators shows that they will have a long life, as the heat evidently does not affect them at all. Working dampers on the blow-gas side of the generators have a tendency to swell endways, but this has been allowed for by giving them more clearance in this direction. They are evidently subjected to a greater temperature than the others, and will not last so long, but they can be easily replaced when necessary without shutting-down.

No trouble has been experienced in lighting-up, and there have been no explosions of any kind in the flues. Mr. Lowe considers that the danger of explosion in the blow-gas flue is obviated by having only one flue for each plant, and by having a damper at the far end of the flue leading into the retort-bench chimney or main flue. When the generators are clinkered, which only occurs (with his coke) about once every fortnight, the damper admitting the blow gas to the chimney is opened. The other dampers admitting the blow gas to the settings are closed until the clinkering has been finished.

The fires are pricked-up and the ashes removed from the ash-pits once a shift. It is not necessary to feed with coke during the night shift, as the hoppers above the generators have ample capacity to carry on till the morning. At present there is great delay in charging, reducing the working day to 19 hours, because all coke has to be taken up by a winch-driven skip on a cableway; but this will be remedied as soon as a telpher plant at present in course of construction is finished.

When this type of plant is installed in conjunction with Mr. Lowe's vertical retorts, the top of the generators will be on a level with the top of the retort-bench, and they will be fed with coke in the same manner as the producers.

The mixed gas, before reaching the holders, is led to a Simmance-Abady recording "Calor-graph." This instrument is checked daily (except Sundays) by a standard instrument, which has also a recording chart. It is the duty of the shift foreman to regulate the supply of steam to the water-gas plant, in order to keep the calorific value as near as may be constant. It has hitherto been found impossible to get the calorific value down to 500 B.Th.U. The steam supply is limited by the size of steam-pipe and steam-meter (1 in. diameter), so that the maximum supply of steam has been given to the water-gas plant, and the calorific value of the mixed gases has been kept as nearly as possible constant by adjusting the exhauster pull (through retort-house governors) on the coal-gas plant. Labour is only required to prick-up, ash-out, and clinker the fires, and to charge-up the generators with coke; and this can be done by the ordinary staff, and does not need a water-gas attendant.

The computation of the saving in coke in the retort-house by the utilization of the blow gases was obtained by counting the number of charges, half-charges, &c., put into the producers on the seven beds in which blow gases were burned, in comparison with the number of charges fed into seven adjacent beds in which no blow gases were introduced.

It is, says Mr. Lowe, obvious that this type of plant could, if desired, be installed with a capacity to enable complete carbonization to be obtained. He is, however, of opinion that it will be best to aim at something less than this. Perhaps a make of 25,000 c.ft. of gas per ton, having a calorific value of 450 B.Th.U. per cubic foot, with a residue of about 6 cwt. of coke per ton for sale will be realizable, with the class of coal he uses.

ADVANTAGES OF THE SYSTEM.

The following advantages for the system here described are claimed by Mr. Lowe.

1.—The plant makes blue water gas with an efficiency of 90 p.ct., because all coke consumed during the blow is utilized as producer gas in heating the retorts.

2.—It can be combined with any existing retort-settings, whether horizontal, intermittent vertical, or continuous vertical. The producer gas from the blow gases does not entirely displace the usual furnaces for heating the retorts, but is an auxiliary heating gas, and its use reduces the amount of coke consumed in the furnaces, because the supply of primary air can be reduced.

3.—By passing all coke through the plant, complete gasification can be obtained, if desired.

4.—It is impossible for blow or producer gases to mix with the coal gases produced by carbonization of the coal in the retorts, as may happen in some plants for complete gasification.

5.—This plant is actually in operation in the Auckland (N.Z.) Gas-Works, and has worked without a hitch for months; the valves automatically opening and closing at five-minute intervals. Experiments will shortly be made to see if any advantage results from reducing the periods to three minutes.

6.—No trouble has ever occurred in starting the plant, and there have been no explosions in the flues. Both water-gas and producer-gas flues are connected to the chimney of the retort installation when starting-up, and so the air in the flues is swept out by products of combustion prior to gas being made.

7.—The generators, having above them large coke hoppers, containing enough coke to last 24 hours, have always a constant depth of fuel on the grates.

8.—Small labour cost. The plant is automatic, the periodic changing of the valves being effected by hydraulic mechanism. No water-gas operator is therefore necessary, labour being only required to clean the fires and fill the hoppers above the generators with coke at intervals of (say) 24 hours. Little clinker is formed, for the reason that the blast pressure is only 3 in. to 4 in. water gauge, and a little steam is introduced during the blow to keep down clinker.

9.—The blue water gas produced is of good quality, and nothing is lost by slightly over-blowing, since all the producer gas made is used in heating the retort-settings.

10.—The clearance-spaces in the generator are small. This has a good effect on the percentage of inerts in the blue water gas produced.

11.—No relief holder is required.

12.—A couple of dust extractors are provided, one on each flue; and as the dust discharge is sealed, dust can be run off at any time. Condensers and scrubbers are only required when the gas is not passed through the coal-gas retorts.

13.—The generators can be placed alongside the ordinary producers for heating the settings, and fed with coke in a similar manner.

14.—This system of blue water-gas manufacture is applicable to the smallest works, because its labour cost is practically *nil*. In many small works the labour cost of operation of a blue water-gas plant of the ordinary type is prohibitive, because it is very great in relation to the output.

15.—The output of blue water gas from the plant can easily be varied by increasing or diminishing the supply of steam. When a steam-meter is put on the steam-pipe (as in Auckland), there is no difficulty in regulating the amount of blue water gas made so that the calorific power of the holder gas is kept uniform.

Submerged Coal Storage.

At Denver, the Great Western Beet Sugar Company have for some years stored their reserve coal under water, as a protection against fire. The Company have several large basins for this purpose, the capacities ranging from 8000 to 12,000 tons level-full, and from 12,000 to 16,000 tons with the coal heaped above the water-level. In the case of a basin for 8750 tons level-full, taking coal to weigh 50 lbs. per c.ft., the length is about 420 ft. and the width 100 ft. at the top. The basin is 8 to 10 ft. deep, the bottom having a fall of 2 ft. in its length of 398 ft. The sides are vertical for 3½ ft. from the top, and then slope to the bottom. The top is 3½ ft. above the level of the ground. The floor and sides are of concrete, 10 in. thick, formed as a 6 in. bottom course and 4 in. top course, separated by a waterproofing layer of asphalt. The lower course is reinforced at 3 in. from the top by a continuous sheet of wire netting of 4 in. triangular mesh. No reinforcement is placed in the upper course. Transverse joints 15 ft. apart are formed in the bottom course of concrete, with longitudinal joints from the last transverse joints to the ends of the basin. These joints are filled with two layers of tar paper. The upper course is divided into slabs 12 ft. by 15 ft., by means of expansion joints in both directions; the transverse joints being midway between those of the lower course. The faces of the joints are painted with asphalt, and then the joints are packed with "Elaterite." On the sloping sides, the tops of the joints are caulked with hemp or oakum, to prevent any flow of the packing. The waterproofing layer between the two courses of concrete is ⅛ in. thick, the surface of the lower slab being first coated with asphalt paint. In order to prevent any possible shifting or creeping of the rectangular slabs, each one is secured to the bottom course of concrete by a steel pin 1 in. square and 6 in. long. A suitable drainage chamber is provided, covered by a perforated plate screen.

THE GUM AND RESIN FORMING CONSTITUENTS IN MANUFACTURED GAS.

By RALPH L. BROWN, Organic Chemist, United States Bureau of Mines, Chairman of the Gas Pipe and Meter Deposits Committee, American Gas Association.

[From the American Gas Association "Monthly."]

There is being experienced by certain gas companies of the country more or less difficulty with the deposition of gummy or resinous material in consumers' meters and, in certain cases, house service-pipes. The results of this deposition are, in addition to the inconvenience and annoyance to both producer and consumer due to stoppages, increased expense and labour in meter repair.

In the following paragraphs there are given briefly, and in part, the preliminary findings in two phases of an investigation being made by the United States Bureau of Mines of this deposition. Advantage has been taken of co-operative aid by the United Gas Improvement Company of Philadelphia and the Committee on Deposits in Gas Pipes and Meters of the Technical Section of the American Gas Association.

In the study of the nature and formation of these deposits, it was recognized at the outset that the basis of the deposits was to be found in the unsaturated hydrocarbons occurring in the gas. In the course of the determination of those unsaturated hydrocarbons capable of forming such gummy or resinous deposits, it was found that, in the several samples of gas condensates examined, considerable—perhaps serious—quantities of indene were present. Its identity has been definitely established. (It is an interesting though incidental fact that the resin producible from the indene content of a typical sample would approximate in value twice the value of the entire sample). Should it prove to be that indene is the sole source or basis of the deposits, it would follow that a solution of the gum trouble is to be found in operating in the generating system of the plant so as not to produce the indene. Another would be to operate so as to remove it before the gas bearing it enters the consumers' pipes. The mechanism of gum and resin formation from unsaturated hydrocarbons need not be considered in this brief report.

The fact that the deposition of gum or resin has developed into a serious difficulty within the last several years brings into the problem many possible factors. Inasmuch as the basis of the material deposited (which for the sake of brevity will be called gum) is unquestionably the unsaturated hydrocarbons occurring in the gas, a general analysis of the problem indicates that one or both of two factors are operating to produce the gum. These are:

(1) More polymerizable or gum-forming material is being passed into distribution pipes and into consumers' meters, either by reason of its greater production or a less complete removal of that material.

(2) More factors are functioning to cause polymerization and gum formation in the distributing systems. These are large in possible number, and may be either physical or chemical in nature. Since production of the gum-forming constituents of a gas must occur in the complex generating equipment of a city gas system, a study of the formation of gum in distribution systems necessarily leads an investigator into a study of the chemical nature and of the production of gum-forming constituents to be found in the gas. In their production, it is inevitable that the materials employed in gas making and the operation in the generating systems must be considered. Physical equipment must also be considered.

A preliminary and limited survey of meter conditions, gas-making materials, and generating system operation, indicated:

(1) That a relationship exists between the character of the gas oil employed and the occurrence of gum deposition.

(2) That operation in the generating system has a decided influence on the amount of gum deposition. The gum-forming constituents of gas come chiefly from the oils cracked in the carburetting units.

(3) That the condensation and purification effected before the gas is delivered to the consumer's meter has an influence on the gum deposition.

(4) That conditions local to a meter have a secondary influence on gum formation and deposition.

(5) That corrosion in meters is a complicating factor, but in itself not a necessary one, in gum formation and deposition.

Grangemouth Gas Deficit.—The Grangemouth Gas Commissioners have a deficit of over £8000 in the last three years. The present price of gas is 5s. 10d. per 1000 c.ft., and an increase of 10d. is being imposed.

Meter Trade Good at Exeter.—Presenting the report of the General Purposes Committee to the Exeter City Council, Mr. Gayton said there was a great boom in the gas-meter trade, and the makers asked if the Committee could arrange to deal with 20 p.ct. more meters than at present. It was decided to secure an additional test-holder and accessories, costing £150, and to engage a junior assistant as a temporary measure, which would permit of an increased output of meters of forty or fifty a day.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

A Meter which Registers Cubic Feet and Indicates Therms.

SIR,—Having read with interest a letter in your issue of Aug. 2, *re* therms and cubic feet basis, and the method of charging same to the consumers, I would like to bring before the notice of your readers my recent invention of an indicating device which registers cubic feet and therms of any declared calorific value, at one and the same time.

This indicating device takes the form of an index, and can be altered to suit any calorific value; and the consumption of gas can be read in both cubic feet and therms, the one corresponding to the other, according to the calorific value of the gas supplied. Means of calculating the cash value of the gas passed through the meter when the price per therm is stated, is also provided for.

This indicating mechanism can be used in place of the ordinary volumetric index, as a combination of both—*i.e.*, therms and cubic feet. It can also be used as an auxiliary index, in conjunction with the ordinary volumetric index for either prepayment or ordinary gas-meters, and can be altered to suit any change of the calorific value, or price per therm, without breaking or interfering with the Government seal.

Should any of your readers be interested in this, I shall be pleased to give them full particulars, if they communicate with me at the address given below.

ROBERT KAY GIBSON.

129, *Gilmore Place, Edinburgh, Aug.* 7, 1922.

The Newspaper Gas Account Agitation.

SIR,—Who is responsible for the agitation now going on in the "Daily Mail" on the question of gas bills? It certainly looks like the work of an enemy.

I enclose copy of a letter which I have to-day sent to the "Daily Mail;" but I do not suppose it will be published.

I doubt if the public ever understood the system of charging for gas by volume. They are less likely to understand the present system, seeing that both volume and heat value have now to be determined in order to calculate the number of therms to be charged for.

Gas Company, Reading, Aug. 4, 1922.

D. H. HELPS, Engineer and Manager.

[ENCLOSURE.]

To the Editor of the "*Daily Mail.*"

SIR,—Referring to the correspondence as to the increase in gas bills, it cannot be too strongly reiterated that the change in the method of charge can have nothing whatever to do with the increase. It would be a matter for surprise if among the hundreds of thousands of gas consumers in London there were not some individual cases where the gas bill is higher than it was a year ago. But the increase may be due to one of many causes; and the reason can only be determined by careful investigation in each case. To say that the change in the method of charge is the cause, is absurd; and I can assure your correspondents whose gas bills are higher, that their bills would have been exactly the same had there been no change in the method of charge, which was made in the interests of consumers at the instigation of the Board of Trade, and in order that the price of gas in all towns could be compared just as the prices of a 4-lb. standard loaf can be compared.

In these days of competition, it would be a suicidal policy for a gas company to supply gas of a quality which would not enable the heat units to be produced and sold at the cheapest rate. The gas industry suffered very greatly during the war, while it was providing explosives to carry on the campaign; and although the revenue of most gas companies was nearly doubled, the dividend paid was only a meagre 2 to 3 p.ct. Can this be said of any other industry?

Yours faithfully,

D. H. HELPS.

Neath Gas-Works Report.

Mr. W. Clark Jackson, the Gas Manager, last week presented his annual report to the Neath Town Council. This showed that the total expenditure on coal during the financial year was £14,289, against £19,182 in the previous year, a reduction of £4893, due to the lower prices of coal and the less amount required owing to the introduction of new plant. There had also been reductions in the cost of carbonizing and repairs and renewals. The expense of distribution was £2779, showing a slight increase. War bonuses to employees had decreased from £6943 to £6045, owing to the drop in wages and the smaller number of men employed. The revenue amounted to £34,026, against £29,736 in the preceding year. The Gas Committee had considered the balance-sheet, and regarded it as a very satisfactory one, and expressed their appreciation of the work of the Manager and his staff. Mr. J. Morris said this was good news, and asked if there was any hope of a reduction in the price of gas in view of the fact that over £4000 had been saved on coal during the year. The Chairman of the Gas Committee (Alderman Charles) replied that it would be better to await the result of the adoption of the therm system of charge. Mr. R. Jenkins said that, were it not for the overdraft, it would have been possible to reduce the price of gas by 1s. per 1000 c.ft. He hoped that a further reduction would be possible in September.

Now that the dark evenings are coming nearer, the Leamington Priors Gas Company are advising gas consumers to take advantage of the Company's offer to overhaul lighting burners free of charge, and to put gas fires and other heating appliances in order at a moderate charge, depending upon the amount of work requiring to be done.

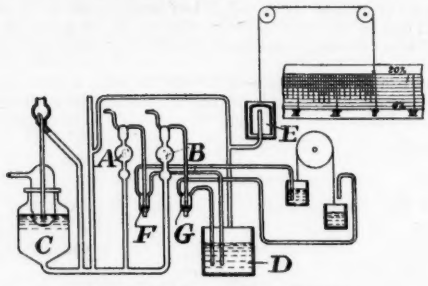
REGISTER OF PATENTS.

Registering Devices for Gas Analyzing Apparatus. No. 157,895.

SVENSKA AKTIEBOLAGET MONÓ, of Stockholm.

No. 313; Jan. 4, 1921. Convention date, Jan. 16, 1920.

When making gas analyses in two or more series—for instance, analyses partly of the percentage of carbonic acid and partly of the percentage of carbon monoxide contained in flue gases—it has been common practice to employ two or more separate systems of apparatus, each operating on a separate diagram. This invention provides means for recording on the chart two or more series of parallel lines corresponding respectively to the series of analyses; the lines which represent corresponding stages in the series lying adjacent to one another and extending in the same direction. One embodiment of the invention is shown in the accompanying illustration.



A Swedish Gas Analysis Recorder.

A and B denote two primary measuring vessels of the apparatus, various gas mixtures being sucked in by a pump C adapted to operate the apparatus. D is the absorption vessel and E the secondary measuring vessel. Branched off from the liquid seals F and G are not only the ordinary pipes leading into the absorption vessel D, but also pipes leading into two receptacles partly filled with a liquid and depending from a pivotally mounted wheel. The ends of these pipes are so arranged that on alternately turning the wheel to and fro, the mouth of one or the other pipe is opened. The wheel is so connected with the apparatus that it will be turned alternately in the one or other direction, as the liquid in A and B falls owing to the action of the pump C.

As on alternate strokes of the pump the mouth of one pipe is sealed, one analysis will be effected with respect to the gas sucked into the vessel B and the next with respect to the gas sucked into the vessel A; whereas alternately the gas mixture in A and in B has free passage into the atmosphere. For each analysis the secondary measuring vessel E will rise a distance which is in reversed relation to the quantity of the gas absorbed in the absorption vessel D. The secondary measuring vessel is connected with the style which registers the result on the diagram. In this embodiment each alternate line of the diagram will indicate the character of the gas flowing into A, whereas the intermediate lines indicate the nature of the gas in B.

If it is desired further to distinguish the two series on the diagram, this may be accomplished by marking them in different colours. The style may then be provided with two tracers, each connected with a receptacle for a colour. In moving up and down, the pen may be actuated in such a manner that alternately the one or the other tracer is brought in contact with the diagram paper.

Water and Steam Supply to Vertical Retorts. No. 165,744.

COLLIN, F. J., AKTIEN. ZUR VERWERTUNG VON BRENNSTOFFEN UND METALLEN, of Dortmund.

No. 17,818; June 30, 1921. Convention date, July 2, 1920.

With vertical retorts having liquid seals for the retort chambers, a water service must be specially provided for refilling the seals. The chambers also require a supply of steam for generating water gas towards the end of the coking process; and this also requires a pipe. As the two services are not continually in use, according to this invention a single conduit is supplied, which can be connected alternatively to the water supply and the steam supply. A pipe is provided at the foot of the retort wall, having a series of ports or nozzles opening into the retort chamber. In order to be outside the open retort space, the pipe is preferably laid in a channel cut in the retort wall.

Purification of Naphthalene.—No. 172,937.

BARRETT COMPANY, of New York (assignees of D. F. GOULD, of Cornwells, Pennsylvania).

No. 30,471; Nov. 15, 1921. Convention date, Dec. 15, 1920.

This invention comprises, in the process of purifying naphthalene, the steps of agitating a molten mass of it with an immiscible liquid, and gradually cooling the mass while agitating it so as to effect relatively slow crystallization of the naphthalene. The following may serve as an example to illustrate the invention, which is not limited to the exact procedure described.

Molten crude naphthalene is introduced into an agitating tank at a temperature of about 85° C. with an equal volume of water at approximately the same temperature, and is vigorously agitated until an intimate mixture is obtained. Cold water is run in, with slow agitation of the mass, at such a rate that the temperature of the mass slowly drops to about 65° C. during a period of about eight hours. The resulting slurry is pumped to centrifugals, where the water and oily impurities which have separated from the naphthalene are removed as completely as possible. The water may be added before the naphthalene is melted, and the mixture of crude naphthalene and water then heated to melt the naphthalene, after which the mixture is vigorously agitated and then cooled. Instead of adding cold water for cooling purposes, the cooling may be permitted to take place by radiation, or cooling coils, or other suitable means.

Some of the advantages of this new process are as follows: There is a decided economy of operation over the old method of cooling in pans, digging out, crushing, and conveying to centrifugals, in that all the materials can be handled through pumps with no manual labour.

There is a further economy in the original investment, in that a complete series of shallow pans with buildings for housing them can be replaced by one or two agitating tanks, which need not even be protected from the weather.

Fire risk necessarily accompanying the use of open pans containing inflammable material is eliminated.

Quenching and Conveying Coke.—No. 182,357.

FRÄNKEL, H. A., of Berlin.

No. 22,080; Aug. 19, 1921.

Hitherto, the patentee says, plants for quenching and conveying coke, in addition to the usual coke-quenching tower, have required a truck, adapted to receive the coke, and besides the workman managing the quenching-tower, a second workman for serving the winding-mechanism driving the truck. The present invention has for its object to avoid the disadvantage by applying a truck, which affords the advantage of dispensing with the winding-mechanism and the workman serving the same, and which is adapted to couple itself automatically with the quenching-tower for the purpose of being displaced together with the latter.

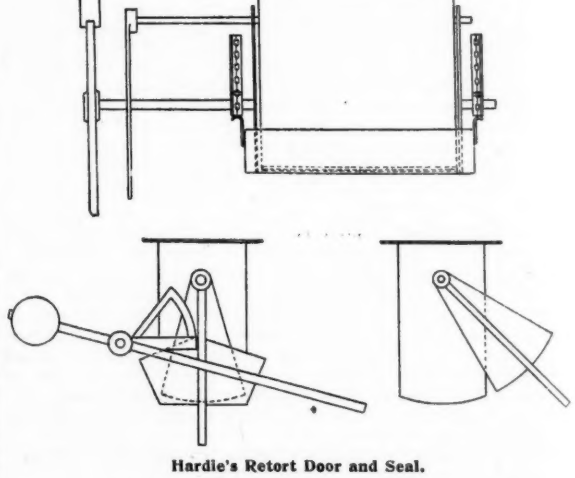
The patentee claims: Plant for quenching and conveying coke with a truck receiving the glowing coke, which is quenched in a movable quenching-tower, characterized by the fact that the movable quenching-tower and the truck are coupled by means of falling latches, arranged on the quenching tower, and of catches arranged on the truck.

Discharging Residues from Retorts, &c.—No. 182,576

HARDIE, G. D., of Clarkston, and MACLAURIN CARBONIZATION LTD., of Grangemouth.

No. 10,338; April 8, 1921.

This invention relates to a device for retaining and discharging coke or ash from retorts in which the material is brought down by gravity. The object is to provide discharging doors which can be easily and quickly operated against a heavy column of fuel, and after closing be easily made gas-tight by means of a swinging water seal.



Hardie's Retort Door and Seal.

As shown in the accompanying drawings, the containing hopper a the bottom of the producer is finished off on a curve, so that it can be almost completely closed by a plate curved to fit. This plate is pivoted to projecting pins on the hopper, so that it naturally hangs immediately beneath the hopper, and thereby holds the material up. The curved plate has affixed to it a long lever arm, which gives power to close the plate against the descending fuel or ash. The movement of the lever up or down allows it to run out at either side of the hopper.

When in its normal position, the curved plate closes the hopper opening sufficiently closely to prevent any solid matter falling out, but does not prevent the passing out of steam or gas. To prevent this, a bucket containing water is suspended by two quadrant arms carried on a shaft to which is attached an operating lever. In its normal position the water in the bucket provides a gas-tight seal for the hopper. To unseal, the lever is operated; when the bucket, riding over quadrants, moves down in a vertical direction until the chains are caught by pins

on the quadrants which cause the bucket to move from beneath the hopper in a horizontal direction, and then vertically to a position of rest completely clear of the hopper.

It is found advisable besides to provide the hopper near the point of discharge with a steam-pipe and to turn on this steam before commencing to discharge, if it is not kept on continuously.

Improved Brick for Water-Gas Generator and other Chambers.—No. 182,572.

HUMPHREYS & GLASGOW, LTD., Victoria Street, S.W.

(A communication from C. S. CHRISMAN, of West Chester, Pennsylvania.)

No. 10,301; April 7, 1921.

The object of the present invention is to provide an internally conical head for water-gas generator and other chambers consisting throughout of bricks of the same shape, and not necessarily of more than two sizes, and which can be laid in self-supporting courses without the use of false work. This the patentees claim to have effected by means of an improved brick or block having the top and the bottom tapering in the direction of the length of the brick, the ends tapering from the bottom towards the top, and the one end portion offset in respect to the other so as to form steps in the top and the bottom only.

Additions to Gas-Stoves.—No. 182,637.

BOHAR, V., of Barnwood.

No. 14,398; May 24, 1921.

This invention consists of a gas-stove combined with a hot-water system, characterized by the combination with the stove of a water heating unit adapted to be fitted between the top of the oven and the hotplate, and heated by the combustion products from the oven; the unit comprising essentially a coil or like device enclosed within a chamber packed with wire, gauze, metallic shavings, or other good heat absorbent. An auxiliary burner may be located within the chamber for heating the coil when the oven is not in use.

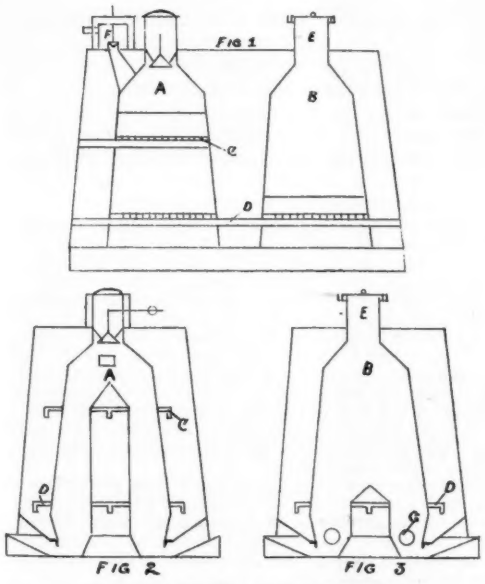
It has previously been proposed to combine with an oven a water-heating system, the water being heated by means of a device in a chamber situated above the oven and below the hotplate; and to such apparatus no claim is made. The invention differs in the disposal of the coil within a heat absorbing chamber packed with heat-absorbing material. No claim is made herein to this means of packing of the coil or the like device *per se*.

Enriched Water-Gas Plant.—No. 182,648.

MACLAURIN, R., of Stirling.

No. 15,203; June 1, 1921.

The invention has for its object the production of an enriched water gas, with the avoidance as far as possible of the formation of clinker. It has also for an object the production of a rich gas with a lower percentage of carbon monoxide than ordinary blue water gas. A two-chambered plant is used; the chamber A as shown being the generator chamber, and the chamber B the combustion chamber. Both are constructed on well-known lines so far as their general form is concerned.



Maclaurin's Enriched Water-Gas Plant.

Fig. 1 is a sectional elevation of the generator and combustion chamber through the centre lines. Fig. 2 is a cross section through the centre of the generator; and fig. 3 a cross section through the combustion chamber.

The method of working is as follows: Bituminous coal, or other material containing volatile hydrocarbons, is fed into the generator chamber, which is kept filled well above the primary air entrance C. When the fuel is kindled, air is blown through the flue C, for the production of a producer gas. This air is always passed in the same direction—viz., down through the coked coal, until it passes to the combustion chamber. Here it meets with the secondary air, entering by the pipes G, and combustion ensues; the burned gases passing away by the stack valve E, which is open during the period of the blow. The blow period is continued until the temperature in the upper part of the generator and the lower part of the combustion chamber are sufficiently high for the manufacture of water gas, when the stack valve E is closed, and the generator valve F opened, the air blasts being shut off at the same time.

Steam (or steam and oil) is now passed into the upper part of the combustion chamber and passes down through the highly heated brickwork. It then flows along the flues and enters at the bottom of the generator, and passes up through the hot coke till it reaches the highly heated coke at the level of the upper flue C, where much of the carbon dioxide formed in the lower part of the generator will be converted into carbon monoxide, and where the hydrocarbons given off in the combustion chamber—when oil is introduced with the steam—will be fixed as permanent gas. Before the steam is turned on to the combustion chamber, fresh coal is put into the generator, and the highly-heated water gas passing upwards carbonizes this coal, carrying forward, and partly decomposing, the hydrocarbons evolved, the water gas thereby being considerably enriched. The use of cannel or other coal rich in oils naturally increases the richness of the gas given off.

The quantity of oil passed in along with the steam enables enrichment to any desired extent; and the oil need only be run in when the temperature of the combustion chamber is best suited for decomposing it into permanent gases. By passing the gases leaving the generator through the ammonia-making zone of a producer, such as is described in patent No. 24,426 of 1913, a large volume of a gas with a calorific value well above 300 B.Th.U. per c.ft. can be obtained, with a lower carbon monoxide and hydrogen content than straight blue water gas.

Combustion of Gaseous Fuel in Furnaces. No. 165,745.

SOCIÉTÉ ANONYME D'EXPLOITATION DES BREVETS COUSIN DITE LE CHAUFFAGE INDUSTRIEL, of Lille.

No. 17,825; June 30, 1921. Convention date, July 1, 1920.

Furnaces for various purposes heated by the combustion of gaseous fuel are known, the patentees remark, in which a refractory checker-work is provided between the mixing and combustion chamber and the working chamber. This checker-work is generally used as a heat-storing apparatus and for the purpose of re-igniting the fuel in the case of an accidental extinction of the flames, and is arranged in a chamber situated over the mixing and combustion chamber in such manner that the material which may be detached therefrom will fall into the combustion chamber. Furnaces are also known for carrying out the process of combustion called surface combustion, in which the refractory material is heaped in any manner; but in this case the combustion process cannot be modified during the operation of the furnace.

The present invention consists in a furnace heated by the combustion of gaseous fuel comprising a refractory checker-work between the mixing chamber and the working chamber, characterized in that the floor of the chamber containing the checker-work extends beyond the piles of refractory material sufficiently to prevent any material which may crumble away from entering the combustion chamber.

Another feature of the invention consists in that apertures closed by blocks and doors are provided in the front side and top walls of the furnace, in line with the refractory checker-work, thereby affording an easy access for removal or replacement without stopping the operation of the furnace.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Aug. 2.]

Nos. 20,155 to 20,833.

BABIN, J.—"Gas-generators." No. 20,803.

B. CARS, LTD.—"Atmospheric blue flame stoves." No. 20,729.

CHILOWSKY, C.—"Atomizing and gasifying heavy combustibles for internal-combustion engines, furnaces, &c." No. 20,231.

DAVIDSON, P. G.—"Means of regulating gas flow to gas-calorimeters." No. 20,384.

DUCKHAM, SIR A. M.—"Heating materials." No. 20,723.

DUCKHAM, SIR A. M.—"Method of briquetting fuel." No. 20,827.

HODGE, G. H.—"Gas-heated steam travelling ovens." No. 20,240.

HUMPHRIES, H. B. P.—"Ammonia distillation." No. 20,684.

JAEGER, A. E.—"Temporary plug for water, gas, &c., pipes." No. 20,225.

JOHNSTON, A. G. KENT.—"Distance gas-lamp lighter and extinguisher." No. 20,381.

LYSCH, G. H. T.—"Supply of gas to burners." No. 20,226.

M'INTYRE, J.—"Prepayment mechanism for gas-meters, &c." No. 20,539.

MANGIAMELI, F.—"Obtaining mixture of gases in any desired volumetric proportions." No. 20,302.

MILNE & SON, LTD., J.—See M'Intyre, J. No. 20,539.

MURRAY, T. G.—"Speed, fluid flow, or pressure, &c., controlling apparatus." No. 20,815.

MURRELL, W. A.—"Gas-meters." No. 20,447.

NEALE, H. A.—See B. Cars, Ltd. No. 20,729.

PETRIE, A. A.—"Valve for coal gas, &c., for household use." No. 20,180.

ROE, E. J. T.—See Hodge, G. H. No. 20,240.

SCOTT, G.—"Valves." No. 20,812.

SHIELDS, C. E.—See Murray, T. G. No. 20,815.

SMITH, H. J. C.—See Murray, T. C. No. 20,815.

TATE, W. R.—See Lake, W. E. No. 20,248.

VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION.—"Continuously-working apparatus for distillation of tar, &c." No. 20,364.

WATSON, T. F.—See B. Cars, Ltd. No. 20,729.

WOODALL, DUCKHAM, & JONES (1920), LTD.—See Duckham, Sir A. M. Nos. 20,723, 20,827.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Chester Gas Bill: Returned from the Commons with amendments, which were agreed to.

Gas Regulation Act Special Orders.

Approval was given to the draft Special Orders proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act on the application of the following undertakings: Borough of Beaumaris, Broadstairs Gas Company, East Hull Gas Company, Elstree and Boreham Wood Gas Company, Ltd., Gas Light and Coke Company, Hexham Gas Company, Hornsey Gas Company, Ramsgate Corporation, Sandwich Corporation, Shrewsbury Gas Light Company, St. Albans Gas Company, St. Anne's-on-the-Sea Urban District Council, St. Austell Gas Company, Uxbridge, Wycombe, and District Gas Company, Wellingborough Gas Light Company, Ltd.

HOUSE OF COMMONS.

Royal Assent.

The following Bills have received the Royal Assent: Birmingham Corporation, Bolton Corporation, Chester Gas, Doncaster Corporation, Neath Corporation, Ramsgate Corporation.

Imported Gas-Mantles and Taxation.

Sir J. NORTON-GRIFFITHS asked the President of the Board of Trade whether he had yet received the report of the Committee under the Safeguarding of Industries Act in respect of gas-mantles; if so, what were the findings of the Committee; and whether he had decided to make any Order in respect to gas-mantles.

Sir P. LLOYD-GREAME, who replied, said the answer to the first part of the question was in the negative. The remaining parts accordingly did not arise.

Gas Companies Charges.

Mr. GILBERT asked the President of the Board of Trade whether his attention had been called to the dissatisfaction among gas consumers in London on the new method of the London Gas Companies charging by therms; whether he was aware that many consumers thought they were overcharged; and whether he would consider the desirability of an inquiry into the present methods of charging by the London Gas Companies, in the interests of the daily consumer.

Sir W. MITCHELL-THOMSON replied that his attention had been drawn to comments in the Press on this subject. The method of charging for gas on a therm basis came into operation in the case of one London company in October, 1920, and in the case of the other Metropolitan companies in April and May, 1921, respectively. Under this method, consumers were charged according to the heating value of the gas supplied, and the local authorities had appointed gas examiners, in accordance with their powers under the Gas Regulation Act. At the time of the introduction of the thermal method of charging, the standard prices were revised, in compliance with the Act. He did not think that any further inquiry on the part of the Board of Trade was called for at present. The Act provided that a local authority might apply to the Board of Trade for a revision of the standard price per therm fixed in the original Order, consequent upon reductions in the cost of making gas since the date of the original Order; and this method of procedure was open to any local authority in whose area the consumers were of opinion that the standard price per therm should be reduced below that given by the Board originally.

Gas Regulation Act Special Orders.

Approval was given to the draft Special Orders proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act on the application of the following undertakings: East Hull Gas Company, Hexham Gas Company, Ramsgate Corporation, St. Alban's Gas Company, Sandwich Corporation, Shrewsbury Gas Light Company, Uxbridge, Wycombe, and District Gas Company, Wellingborough Gas Light Company, Ltd.

Benzole Production in the United Kingdom.

Mr. KILEY asked the President of the Board of Trade whether he could state how many gallons of benzole were produced in the United Kingdom during the last twelve months.

Sir P. LLOYD-GREAME replied that he had been unable to secure information showing the production of benzole in the United Kingdom for the twelve months ended June last. During the calendar year 1921, the National Benzole Association estimated that the quantity produced by the members of the Association was approximately 9,000,000 gallons; and the output by non-members was believed to be about a quarter of that of members. Owing to the stoppage in the coal mining industry, the production of benzole in 1921 was greatly reduced, and, according to information furnished to him, the present normal output was at about double the rate estimated for 1921.

Newcastle (Staffs.) Gas Undertaking.—It was reported to the Newcastle (Staffs.) Town Council that there had been a loss on the gas undertaking for the past financial year of £997. Alderman G. Scott (the Chairman of the Gas Committee) remarked that, despite this loss, the position of the concern was better than the Committee had anticipated. At the end of the first half of the year, when a balance was struck, they found that there had been a loss of £2700. With careful management, however, they had been able to reduce this to £997. The gross profit for the year was £3591, or some £185 more than for the previous year. The prospects were very hopeful, and the Committee trusted that in September they would be able considerably to reduce the price of gas.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" regarding applications to the Board of Trade for Orders under the Gas Regulation Act.

Town of Dudley Gas Light Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8·65d. per therm.

Tawe Valley Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. 1d. per therm.

DECLARATIONS OF CALORIFIC VALUE.

Bromsgrove Gas Light and Coke Company.—450 B.Th.U. (Sept. 25.)
Farnworth and Kearsley Gas Company.—480 B.Th.U. (Sept. 20.)
Freshwater Gas Company, Ltd.—500 B.Th.U. (Oct. 1.)
Knottingley Gas Company.—425 B.Th.U. (Oct. 1.)
Swindon United Gas Company.—400 B.Th.U. (Oct. 1.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Leicester Corporation.

This Order is in the usual terms, enabling the Corporation to charge for thermal units supplied in the form of gas.

Peterborough Gas Company.

After the declared date: (i) The standard price in respect of gas supplied by the undertakers shall be 10·8d. per therm. (ii) The prices of 11·2d. and 10·4d. per therm respectively shall be substituted for the prices of 3s. 2d. and 2s. 10d. per 1000 c.ft. mentioned in the first proviso to section 31 (dividend dependent on price charged) of the Peterborough Gas Act, 1906.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-two-fifths.

Prepayment meter clauses are included. (July 28.)

Westhoughton Consumers' Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16·8d. per therm. (July 28.)

BRITISH ENGINEERING STANDARDS ASSOCIATION.

Annual General Meeting.

The British Engineering Standards Association held their fourth annual general meeting on Thursday, July 13, at the Institution of Civil Engineers, when the Chairman (Sir Archibald Denny, Bart.) presented his annual report, and made a review of the position. The meeting was well attended, and the Chairman's report again showed great expansion in the work.

There are now nearly 2000 engineers who give their time and experience to this National Institution. Last year just under £17,000 was expended, towards which industry, in spite of the depression in trade, contributed £9300; the remainder coming from the Government, the India Office, and the Governments of the Dominions overseas. The Chairman thanked all those firms who, notwithstanding the grave difficulties with which they had one and all been faced, had so liberally supported the Association. At the same time he felt that the Association should not have to live quite so much from hand to mouth, and should be able to build-up a small reserve. This could be accomplished without difficulty if industry would still further increase its subscriptions, and if the many firms who, so far, did not financially assist would agree to become annual subscribers. He then passed in review the progress of the work in the various sections.

The Association have issued 72 new and revised specifications during the year, and the sales of the publications have reached 39,000, in addition to a very large number of aircraft specifications distributed on behalf of the Air Ministry. A certain number of constructive suggestions were made by those present, which will in due course be considered by the Main Committee.

In forwarding this report, the Association say: "Once again we would counsel industry generally to support the Association financially, in order that they may carry out the work in hand, and be in a position to look forward to increased usefulness in the future. It cannot be too emphatically urged that contributions to this organization should be considered as a sound business investment from which an adequate return is expected—and indeed, as all will agree, obtained."

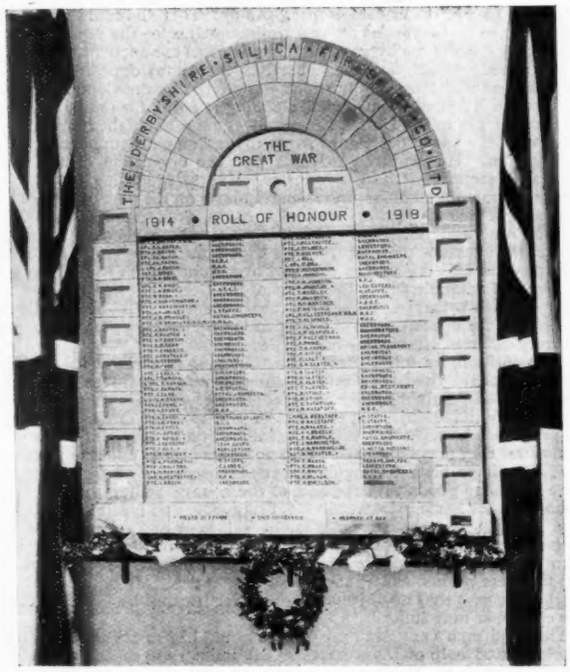
The consumption of gas, it was stated at a meeting of the Wath and District Gas Board, had increased 185 p.ct. in the Bolton district since the undertaking was acquired by the Board twelve years ago. In the Wath district the consumption had increased 39 p.ct.

THE FRIDEN WAR MEMORIAL.

His Grace the Duke of Devonshire unveiled on Saturday, July 22, at the Friden Brick-Works, the memorial to the employees of the Derbyshire Silica Fire Brick Company, Ltd., who fought and fell in the war. He was supported by the Deputy-Lieutenant of Derbyshire, Col. H. Brooke Taylor, C.B.E., Mr. C. F. White, M.P., Messrs. Frank West (Managing Director), Alderman F. J. West, C.B.E., and other Directors, with the assembled officials and workpeople of the Company, and the relations of those in whose honour the memorial had been erected.

Friden has reason to be proud of its record in the war. Over eighty, or 50 p.ct., of the Company's men joined the Colours early in the war, and of these men twenty laid down their lives. Their places were taken by women, young and old; and Friden's product was very largely used in the enormous steel-works expansion immediately following the demand for munitions. Night and day these women did the work left by their men, and, though those who came through the great ordeal with their lives and strength have returned to their work, the women remain as a permanent portion of the works personnel, forming a much-needed reinforcement in a district where the population is small in numbers and sparse in distribution.

In a few well-chosen words, the Duke—"our Duke," as they affectionately called him—emphasized the fitness and propriety of erecting memorials of this character to remind, not only ourselves, but succeeding generations, of the terrible facts and the great victory with which we are still familiar. But the Friden war memorial is of particular interest. It is constructed of "bricks, blocks, and tiles" built into the inside of one of the permanent walls of the works.



Designed in competition by one of the Company's workmen, made from materials taken from the Company's pits, moulded by the workpeople, and burnt in the works kilns, it is a most fitting expression of the affectionate memory of the little community. All the workpeople, from the Managing Director to the youngest girl, have taken part in the making of the bricks and blocks or the erection of the memorial, and all have contributed to the cost of it; the time spent on this work having been, by their own particular request, deducted from that appearing on the pay-sheets. It will look down on the activities of the workshops as long as they exist.

In the afternoon of the same day, the annual cricket match between the employees of the Derbyshire Silica Fire Brick Company and those of West's Gas Improvement Company was played at Friden and attended by many visitors from Manchester. It was, perhaps, a little unfortunate that the victory fell to the Manchester men, but, when the cup was handed to the Manchester Captain by Mrs. Bainton after tea (which was served to about 250 guests), the Friden people bore their loss with good humour.

The day's proceedings ended with brief speeches.

Extension of Mains at Llandudno.—With regard to a proposed extension of the gas-main along Marine Drive West, the Gas and Water Committee reported to the Llandudno Council last week that at the present time they were unable to deal with the extension. Mr. W. Thomas, in reply to a question, said the reason why the Committee felt they could not extend the main was that it would cost £200, and no provision had been made in the estimates. Mr. Davies said surely the Council would sell sufficient gas to pay for the outlay; and he moved that the matter be referred back to the Committee. Mr. Thomas said he was in sympathy with the amendment. They had laid down an extensive plant to enable them to take on new consumers, and it was estimated that they would sell quite sufficient gas to justify the expense of the main. There were also other areas in the town which should be considered in regard to the extension of the mains. The proposal to send the matter back was carried.

MANCHESTER GAS DEPARTMENT REPORT.

At their meeting last Friday week, the Gas Committee of the Manchester Corporation—the Chairman (Sir William Kay) presiding—adopted the report for the year ended March 31, for presentation to the City Council.

The report indicates progress in several directions. It is true the gross profit is some £9000 less as compared with the preceding year; but when one considers the difficulties that have been encountered, there is ground for satisfaction. The full summary of income and expenditure shows that rent and rates are several thousands higher this year than last. It is so also with the cost for interest on loans and for income-tax.

1921.			1922.	
£	£		£	£
		INCOME.		
	1,179,439	Gas, &c.		1,318,610
		Residuals, &c.		
433,245		Coke	339,319	
143,097		Tar	60,004	
14,923		Sulphate of ammonia	11,372	
	591,265			410,695
	1,065	Sundry receipts		2,178
	1,771,769			1,731,483
		EXPENDITURE.		
		Manufacture—		
808,860		Coal and oil	808,837	
351,444		Carbonizing wages, maintenance of plant, &c.	334,106	
30,428		Renewals	22,627	
	1,190,732			1,165,570
		Distribution—		
186,590		Maintenance of plant, salaries and wages, &c.	177,994	
70,680		Renewals	56,369	
	257,270			234,363
	94,553	Rents, rates, &c.		101,103
		Management, collection, &c.—		
47,369		Salaries and wages	43,820	
4,218		*Less*—Received from Electricity Committee for collection of accounts	6,326	
43,151			37,494	
27,021		Other charges	42,918	
	70,172			80,412
	1,612,727			1,581,448
	159,042	Gross profit for the year		150,035
50,658		*Less*—Interest on loans, &c.	81,880	
258		Income-tax	3,265	
	50,916			85,145
	108,126	Net profit		64,890

The quantity of gas sold was 5,961,538,000 c.ft., an increase of 3·64 p.ct. on the corresponding figures for the previous year, and the average price realized was 4s. 4·30d. per 1000 c.ft.

The cost of coal and oil was as follows, the figures for the previous year being given for comparison:

—	Gross Cost.	Less Income from Residuals.	Net Cost.
	s. d.	s. d.	s. d.
Last year, per 1000 c.ft. sold	2 8·56	1 4·53	1 4·03
Previous year ,, ,,	2 9·75	2 0·67	0 9·08

The difference represents an increase in net cost to the Committee of £172,636. The average gross cost of coal only, inclusive of cost of handling, was 39s. 10·74d. per ton, as compared with 37s. 7·11d. for the previous year.

The miners' strike naturally caused considerable difficulty in the maintenance of coal supplies, and the necessary purchases of overseas coal account mainly for the increased cost. The supply of gas was, however, well maintained throughout the period of the strike, and, as on previous occasions, special arrangements were made for the supply to poor people of coke in small quantities at reduced prices.

The amount transferred from revenue to the credit of renewals account was £80,330, which, together with the interest on the fund, made a total credit for the year of £84,570. The sum of £94,818 was expended during the year. The balance to the credit of the account is now £131,106.

Additional loan capital, excluding that required for the purchase of the Stretford Gas Company's undertaking, has been raised to the extent of £527,000 during the year, mainly for the extensions in progress at the Bradford Road Works, and for distribution purposes. The capital expenditure for the year amounts to £484,370, of which sum £9859 has been provided out of profits, and the balance out of loans. The total capital outlay at March 31 was £4,144,815, the loan debt in respect of which was £1,660,521.

Powers have been obtained to acquire land at Partington and Carrington, adjacent to the Ship Canal, and to erect gas-works thereon. Powers were also secured to purchase the undertaking of the Stretford Gas Company. In pursuance of these powers, the Corporation took over the undertaking from the Stretford Gas Company on Dec. 31,

1921. From this date the consumers in the area formerly supplied by the Company had the benefit of the same terms as consumers within the city, both as regards the price of gas and the abolition of the charge for cookers. These terms will continue so long as the Stretford undertaking remains the property of the Corporation. In the event of the Stretford Gas-Works passing into the possession of a Joint Board, Manchester's outlay in buying the works and maintaining them since the purchase will have to be repaid by the Joint Board.

The cost of gas in the Manchester area has been reduced 4d. per 1000 c.ft., and the Committee are confident that they will be able to make a further reduction in September next.

The number of gas consumers is 876 more than it was a year ago, while the cookers, grillers, and fires in use show an advance of 7215 during the year.

WEST BROMWICH GAS UNDERTAKING.

The accounts of the West Bromwich Gas Undertaking were presented to a recent meeting of the Town Council, when it was shown that the total income for the past financial year was £130,014, as compared with £155,825 for the previous year—a decrease of £25,811. The gross profit amounted to £4627, and after meeting interest and sinking fund charges amounting to £8824, there is a net loss for the year of £4196, as compared with a net profit of £4020 for the preceding year. The Committee recommended that the net loss be carried to the net revenue appropriation account.

Alderman Cox said he was sorry the Committee could not present a very satisfactory report from a financial standpoint, but the Council knew the trouble there had been with the coal strike and other matters connected with the sale of the various bye-products. The decreased income was due to the falling-off in consumption of gas and the reduction in the price obtained for residuals. The decrease from the sale of gas was £12,908, and of this he was sorry to say that £8441 was in respect of power consumption. This was not only a serious matter for the Committee, but for the whole town, because if this amount had been paid to the Committee for gas there was no doubt a very large sum of money would have gone into the pockets of the inhabitants in the shape of wages. The result was bad enough, but not quite so bad as it appeared, because, though there was a net loss of £4000, £1400 of this had been spent out of revenue on the new benzole plant, and, in addition, there was £800 for the mains on the Tantany and Westbourne housing estates. The latter was a serious loss, because he believed he was right in saying that not one-half of the houses were yet occupied, and consequently the Committee had no return for their expenditure. During the whole of the year the selling price of gas was 5s. per 1000 c.ft., which was very much below some of the towns around them; and from the beginning of last quarter they had made a reduction of 6d. per 1000 c.ft. There were also two reductions in the price of coke, amounting to 10s. per ton.

He moved the adoption of the report, which was carried.

SHIPLEY GAS-WORKS RESULTS.

The financial results of the operations of the Shipley Gas-Works for the year ended March 31 were presented by Mr. E. Hyde (the Chairman of the Gas Committee) at a recent meeting of the Urban District Council.

Mr. Hyde said it was with very great regret that, in presenting the financial results of the past year's working, he had to report a net loss of £5300. The accounts showed an income of £81,596 and an expenditure of £67,030, leaving a gross profit of £14,566. Loan charges of £19,900 had to be met, leaving a net deficit of £5334. After the satisfactory increase in the gas sold (£6400 more than in the previous year) and good working results obtained by the Engineer and Manager (Mr. H. Burton), it was not a little disappointing to find that the advantages so gained were more than nullified by the collapse of the market for bye-products. The receipts from this source were nearly £5000 less than in the previous year, while coal cost £3500 more. The loan charges before mentioned, also, were £1170 in excess of the previous year, on account of the increased rate of interest. It would be noted, therefore, that the deficit had been caused by circumstances over which the Committee had no control. It was estimated that the national coal dispute cost the department £1100, as, though they were prepared with a stock of coal sufficient to maintain a full supply of gas for four months, it was decided to help the public by supplying a portion of this for domestic purposes, and 1400 tons were sold at cost price (45s. per ton). This, together with the 3200 tons of coke and breeze sold during the stoppage, helped to relieve the situation in the township. The supply of gas was maintained during the closing weeks with coal costing £5 per ton.

The Committee had considered the estimates for the present year, but, as the fall in value of coke, tar, &c., continued, they could not recommend an immediate reduction in the price of gas, if they were to meet their liabilities.

Council's Tribute to Gas Company.—A new lighting scheme for the season 1922-23 for Wellington (Salop.) was adopted by the local Council on Wednesday last. The scheme presented by the Surveyor provides for thirty additional lamps and twelve large lamps, the latter to be lit during the whole of the night in the main thoroughfares of the town. The Company undertook to convert all the upright incandescent burners into double lights, and twelve lamps would have cluster lights. The total charge would be £614, or £22 only more than the charge last season, with the additional thirty lamps. The Chairman (Mr. G. W. Harvey) said the Company had again shown public spirit in assisting the Council. The necessity for more light was admitted, and the whole scheme would be a benefit to the town.

WELSBACH LIGHT COMPANY, LTD.

Position of the British Mantle Industry.

The Annual General Meeting of the Company was held on Friday last, at Winchester House, Old Broad Street, E.C.—Mr. J. R. YATES (the Chairman) presiding.

The SECRETARY (Mr. E. J. Butcher) read the notice convening the meeting; and the report of the Directors [*ante*, p. 276] and the statement of accounts for the financial year ended March 31 last were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that in them would be found the record of another year of arduous work on the shareholders' behalf. When they looked around at the results of the industrial concerns throughout the country, with their almost unbroken series of depreciation and loss, and remembered that, apart from the general trade slump, their Company had had to battle against insidious and unfair competition, aided by currency conditions amounting to a huge bounty on competing foreign goods, he trusted that their showing might not be unfavourably regarded. At any rate, several of the biggest shareholders had expressed themselves in terms of agreeable surprise, and the large numbers who had sent the Board their proxies appeared to take a similar view. The shareholders would find on reference to the report how the procedure he foreshadowed last year had been carried out, though not yet concluded. Under Part I. of the Safeguarding of Industries Act there was a very long and hard-fought struggle. The mantle manufacturers gained something, though they strove to gain more. As the matter now stood, a duty in respect of all imported mantles was being imposed amounting to one-third of the value of the dutiable ingredients—as such, and not one-third of the value which those ingredients had assumed as the essential part of the mantle proper. As to Part II., he could not speak so completely as he had at one time hoped, since the report of the Statutory Committee by which the inquiry was conducted had not yet been issued, though expected shortly. Strenuous opposition to the mantle manufacturers' applications was offered by the Central Executive of the National Gas Council, claiming to speak for the bulk of the makers of gas in the United Kingdom—though he might remark that several of the gas undertakings wrote to the Company supporting their application. He ventured to think that the opposition of any considerable section of the gas industry to the safeguarding of British-made gas-mantle manufacturers—particularly on the part of those who themselves had a statutory monopoly in the production of gas—was inopportune and impolitic. If this opposition were successful, and if the British gas-mantle industry were wiped out, there would again be the position existing before the war, of a monopoly of the whole incandescent mantle trade in the hands of the Germans; and they would very soon see prices put up against the consumer. The second body to join in the opposition to the application under Part II. were of an entirely different character—namely, the importers. With regard to this opposition, he might quote the following remarks made by the President of the Board of Trade, in the recent fabric-gloves debate in the House of Commons: "Importers of foreign goods, with admirable impartiality, have objected, and will object, to every Order that may be proposed, because they see in the imposition of any duty a possibility that they may be deprived of a portion of those enormous profits that they have been making during the last year or two by importing cheap German goods with the help of the bounty, selling them in this country at the same price as the English goods, and putting into their own pockets what the consumer might well hope and expect to have. I have not the slightest objection," said Mr. Baldwin, "to anybody who can making good profits, if he will only honestly say that he is out for these profits, and is anxious to keep them. My only objection is when he says that he objects to any Order because he is afraid that the consumer may suffer."

The Chairman went on to say that he would like to acknowledge the wholehearted help of the workers in the industry in regard to the inquiry. Though the trade union leaders, as such, did not see their way to give their official aid, their members voluntarily co-operated in supporting the application, both by holding meetings and by giving evidence before the Committee—and very effective, well-given evidence it was. There were very few articles of manufacture in which the cost of the complete article arose from labour, direct and indirect, as in the case of the incandescent mantle, which passed through some fourteen or fifteen distinct operations. There was therefore this anomaly—which he hoped might in time be remedied—that such protection as was afforded by Part I. of the Act, as now interpreted, was given to the ingredients in their raw state, but no protection was afforded to their workers against the labour of the German worker which turned those ingredients into the finished mantle—labour which was paid for at the equivalent of less than a penny an hour. If the many millions sterling that went in unemployment relief were expended in the purchase of British-made products, even at slightly enhanced prices, they would thereby give employment to the worker, and contribute to his well-being and self-respect, instead of demoralizing him by doles, while the community, both morally and materially, would be the gainer.

There were, the Chairman declared, still great opportunities for gas and gas-mantles—especially if gas managers would devote somewhat more attention to the lighting load and not concentrate wholly (or nearly so) on heating, leaving lighting as the "Cinderella" of the industry. Numbers of new buildings for workmen and others were being, and will continue to be, erected. For these dwellings, gas cooking and heating would largely be resorted to. Having the gas laid on for the purposes, it was far more economical to use gas as an illuminant than to instal, at large expense, the apparatus for electricity. The mantle manufacturers could say this—that the percentage attributable to the mantle of the total cost of maintaining gas lighting was a less percentage than that which prevailed before the war. He would support the plea of an eminent representative of the gas-producing enterprises—Dr. Charles Carpenter, President of the South Metropolitan Gas Company—for the use of good and reliable fittings and burners for gas, rather than the cheap rubbish with which the market was largely flooded. Better results would thereby be attained, and causes of complaint, and even personal risk, eliminated.

Reference was made in the report to special measures adopted to meet a position of unusual difficulty. In common with other British mantle manufacturers, the Company had offered a rebate bonus to be credited at the end of the season to those of the dealers who undertook to buy and sell throughout the season British-made mantles exclusively. Large numbers of dealers had accepted this scheme, and given an undertaking to deal solely in British-made mantles. Experiments had been constantly carried on to improve the manufacture and durability of mantles for high-pressure lighting; and the Company were working in the closest touch with the Trinity House engineers in developing improvements in lighthouse and similar equipment. He added that theirs was the only Company who manufactured mantles for use in British lighthouses. He wished, however, to emphasize the fact that the gas-mantle was by no means the one and only commodity in which the Company dealt. The well-known Welsbach-Kern radiator had been improved in very many respects since last season, and could now take with practically equal efficiency almost any one of the widely varying qualities of gas supplied by different gas undertakings. It was undoubtedly the most economical and efficient heating stove on the market. The Company were also dealing with other gas heating appliances, gas-cookers, gas-irons, hotplates, &c., and were developing this side of the business. In addition, new lines of oil lighting and heating apparatus had been invented and patented, and were about to be put on the market. These comprised a pressure oil-radiator, which marked a great advance on all other existing oil-heating apparatus. This radiator should find a large market—especially in places where gas and electricity were unavailable, and fuel not easy to secure. Generally, the Company were tending to broaden the basis of their business in other goods than their own specialities. With their organization and resources, they intended to be ready for, and take part in, that revival of business to which everyone looked forward on the passing away of the present slump.

With regard to the accounts, the net profit of £9725 was subject to income-tax and corporation profits tax, and took no account of anything the Company might recover in respect of excess profits duty. The question of this recovery was still under discussion with the authorities, and the Directors could not say how it would work out; but it was expected that the "E.P.D." recovery would cover the claim for income-tax and corporation profits tax. The investments, other than those in Associated Companies, though changed since last year, still figured in the balance-sheet in high-class gilt-edged securities, which had considerably increased in value. Stock had been written-down to lowest market value or cost, whichever was the lower.

Mr. H. W. WALMISLEY formally seconded the motion for the adoption of the report and accounts, and the declaration of a dividend of 5 p.ct., less income-tax; and after some discussion, this was carried *nem. con.*

Sir James Remnant, Bart., M.P., was re-elected a Director; and the Auditors (Messrs. Deloitte, Plender, Griffiths, & Co.) having been re-appointed, a cordial vote of thanks to the Chairman, Directors, and staff concluded the proceedings.

GLASGOW GAS DEPARTMENT'S REPORT.

The fifty-third annual report of the Glasgow Corporation Gas undertaking, which embraces the year from June 1, 1921, to May 31, 1922, states that the gross revenue amounted to £2,274,907, and the gross expenditure to £2,346,952, to which is added depreciation written-off capital assets, £124,956; the balance carried to the debit of profit and loss account being £197,000.

The Committee had to meet the following requirements during the year; Annuities on stocks, £18,639; interest on borrowed money, &c., £128,928; and sinking fund, £104,855—leaving a deficit on the year's operations of £449,423. The rate of interest payable to the Corporation loans fund in respect of money borrowed was at the rate of £5 1s. 9d. p.ct., as compared with £4 14s. 9d. p.ct. for the preceding year. The amount contributed to sinking fund for redemption of annuities and loans was £104,855, to which is added £1065, the accumulations of the unappropriated portion of the sinking fund, making a total addition to the fund of £105,920 during the year. The sinking fund, with its accumulations, now stands at £1,741,440, of which there has been applied in the redemption of borrowed money and annuities £1,720,072, leaving still available the sum of £21,368.

The quantity of coal carbonized during the past year was 733,585 tons, as compared with 831,785 tons for the preceding year, a decrease of 98,197 tons. The average cost of coal carbonized last year was 38s. 8·482d., being an increase of 7·511d. over the preceding year. The quantity of coal gas made per ton of coal carbonized was 11,319 c.ft., which, with water gas, gave an average of 12,155 c.ft., as compared with 10,128 c.ft. and 10,886 c.ft. respectively per ton for the previous year. The quantity of gas delivered and accounted for during the year amounted to 7,971,281,583 c.ft., as compared with 8,454,614,116 c.ft. for the preceding year, a decrease of 483,332,533 c.ft., equal to 5·716 p.ct.

The unaccounted-for gas during the year was 10·604 p.ct., as compared with 6·635 p.ct. Owing to reorganization of the meter survey department last year, ten days' survey of the financial year under review was included in previous year's statistics. This being equal to 2 p.ct. levels-out the unaccounted-for percentage to 8·635 in 1921-22, which is equal to the average of several years. It is hoped by vigorously continuing the policy of lifting and renewing or replacing worn-out mains and service pipes, and overhauling or renewing faulty meters, gradually to reduce the unaccounted-for percentage.

The net sum realized from the sale of coke this year amounted to £299,369, being £291,687 less than that of the preceding year. The number of ordinary meters in use on May 31 last was 192,642, as compared with 192,636 for the preceding year.

The Hawick Gas Light Company are reducing the price of gas from 5s. 10d. to 5s. 4d. per 1000 c.ft. At Johnstone, the price has been lowered by 5½d. to 3s. 6½d. per 1000 c.ft.; and the rate for Paisley is being reduced by 8d.

GLOVER-WEST VERTICALS FOR OLDBURY.

Ministry of Health Inquiry.

At Oldbury, on Friday, the 21st ult., Dr. A. W. Brightmore held an inquiry on behalf of the Ministry of Health relative to an application by the Urban District Council for sanction to borrow £20,000 for the provision of a Glover-West vertical retort installation. The period for which the loan was asked was fifteen years.

In his evidence, Mr. Charles H. Carder (the Engineer and General Manager) said the loan was required to enable the Council to put down a Glover-West vertical retort installation of 16 retorts capable of carbonizing 80 tons of coal a day, and producing from ordinary coals a gas yield of not less than 1 million c.ft. of straight coal gas a day (with facilities for increasing the output by steaming the charge), together with the necessary coal-handling plant and storage hoppers. This installation would be of approximately double the capacity of the existing carbonizing plant, and would supersede the present retort-settings, built in 1895, but not the retort-house, which would be used as a boiler-house and fitting shop. There did not appear to be any loans outstanding in respect of the plant to be scrapped.

The provision of new and larger carbonizing plant was urgently necessary, because the present retort-settings themselves were worn out, were not large enough to provide for the consumption of gas in the district, and were very expensive in operation. The present carbonizing plant consisted of one bench of seven beds of retorts, Klonne type, eight single-ended retorts 10 ft. 6 in. by 23 in. by 16 in. in each, 56 retorts in all, hand stoked, with a total carbonizing capacity of 43 tons 15 cwt. of coal a day, capable of producing with good quality coals about 550,000 c.ft. of gas daily. There was not room in the retort-house to extend the plant, either by the provision of additional beds or by converting to through retorts, even were an extension of the present type of settings desirable.

For the last few years the maintenance of the gas supply during the winter months had been entirely dependent upon the admixture of a large proportion of carburetted water gas; the daily winter output under normal trade conditions reaching over 1 million c.ft. The industrial load was normally very heavy, and the falling-off in trade had affected them seriously. There were, however, definite signs of the revival of the demand for gas for industrial purposes, and the domestic consumption was also likely to increase considerably, following the completion of two housing schemes within their gas area, providing an additional 566 houses to date, and fostered by the reductions which had been made in the price charged for gas during the past twelve months—for domestic consumption from 5s. 6d. to 4s. 3d. per 1000 c.ft., and for industrial purposes from 4s. 8d. to 3s. 5·8d. per 1000 c.ft. The present proposal was part of a scheme for the enlargement and reconstruction of the works to enable them to meet the present and prospective demands for gas more satisfactorily, comprising, in addition to the retort-house, provision of new and larger condensers, coke-handling plant, and re-arrangements of boilers and exhausters, washers, and pumps, with the necessary alterations to works mains, at a total cost of approximately £24,000, of which it was proposed to find from revenue all above £20,000. The price quoted for the complete vertical installation was £19,261, *plus* £2464 for reinforced raft foundations, for which the tender of West's Gas Improvement Company had been provisionally accepted.

The number of men required to work the plant when full on was two per shift, or six men per day, handling everything from the coal breaker onwards, to which must be added one man per shift for boilers, exhausters, &c. The same number of men would be required if the plant was only partly at work. With the present plant, to make a million c.ft. daily required in the retort-house 23 men, and for carburetted water gas 9 men, or 32 men per day. The summer make of up to 400,000 c.ft. a day could be met by either five beds of retorts in the retort-house (19 men per day) or three beds (13 men), and carburetted water gas to make up the balance (a further three or six men per day as required). For the year ended March 31 last, on an output of 164,403,000 c.ft., there was paid in carbonizing wages, including carburetted water gas, £4786. The requirements of the proposed new plant would be met by £4 13s. per day for 365 days, *plus* 30 days' overtime allowance, or £1836. There was thus an apparent reduction of labour costs of £2950, less provision for reduction in rates of wages (say) £360—net reduction £2590. With an estimated saving in carbonizing material of £3439, there would be a total gross saving of £6029. Deducting interest and sinking fund charges would give a net saving in cost of manufacture of £4229 per annum, which, on an output of 164,403,000 c.ft., equalled 6·99d. per 1000 c.ft. available for reduction of the price of gas. As the output of gas increased, the relative economy would also increase, as no additional labour would be required up to the limit of capacity of the plant.

Mr. Burnard Geen (Consulting Engineer to West's Gas Improvement Company) gave evidence as to the foundation work in connection with the installation, and the proposed reinforced concrete raft foundations. He expressed the opinion that the foundations were satisfactory for the proposed installation.

Councillor Wilson (as Chairman of the Gas Committee) and Councillor Quayle also supported the application.

Subsequently the Inspector paid a visit to the gas-works.

Olympia Cookery Competition Prize-Winners.—In the list of prize-winners in the cookery competitions at the "Daily Express" Woman's Exhibition at Olympia, given on p. 275 of last week's "JOURNAL," the third prize of the Children's Cookery Championship (won by Miss Doris Scutt) should have been £2, and not £3 as then stated.

Annan Gas Company.—The revenue of the Company for the past year was £10,703, and the expenditure £9885. A dividend of 7 p.ct. (free of tax) is declared. A sum of £200 is added to contingency and insurance account, and a balance of £320 carried forward. The increase in the quantity of gas used during the year was 1,785,800 c.ft., as compared with the previous year. An additional holder is to be erected, at a cost of £5500.

SCHOOL LIGHTING BY GAS.

The Education Committee of the London County Council report that they have had under consideration for some months past the question of the gas lighting of educational institutions, particularly of those elementary school buildings largely used in the evenings. A great number of complaints have been received as to the unsatisfactory lighting of the rooms used by evening institutes. At present the large majority of the schools are lighted by incandescent burners of the upright type, which are relatively inefficient and wasteful, and involve considerable labour and expense in maintenance. The Committee have had before them representations from the L.C.C. Schoolkeepers' Association, on the question of the labour of maintenance of these burners.

During the winter of 1920-21, the Committee arranged with the two largest Gas Companies, as an experiment, to renovate and maintain the gas lights in 24 selected schools at cost price, in order to obtain information as to the probable expense in handing over to the gas companies the maintenance of the gas installations of all the educational institutions. The results of the experiments convince them that it would be uneconomical to proceed further in this direction.

The Committee have now had proposals for replacing the upright burners, in the schools largely used in the evenings, by modern superheated inverted burners, adaptable to the existing fittings. From experiments conducted in selected schools, it appears that the cost of these inverted burners will be recovered by deductions in the gas consumed in from five to six years, after which time there will be a considerable permanent saving; also that the lighting will be improved, and the cost of maintenance will be reduced. The average cost of installing the inverted burners would be about £110 for each school. The Committee are of opinion that it would be sound economy to proceed at once with the installation of modern inverted gas-burners in about one-third of those schools largely used in the evenings—*i.e.*, between fifty and sixty schools. As soon as the consumption of gas in these schools for some of the winter months is known, they propose to consider whether the remainder of the schools should be dealt with similarly in one year or in two years.

The Committee have received from the South Metropolitan Gas Company a proposal that the work of installing the inverted burners —according to the Council's specification—in the schools in their areas should be undertaken by them and payment by the Council spread over twenty equal quarterly instalments. On the assumption that this Company's prices for the new burners, and the work of installing them, are not higher than the architect's estimate, it would appear that the acceptance of their offer would enable the Council, in return for the outlay during the first year of the cost of re-fitting one school, to realize forthwith the saving in consumption and maintenance in respect of five schools. The proposal, therefore, presents possibilities of carrying out the main object of improving the present unsatisfactory lighting of the schools on very favourable terms. The Committee are giving further consideration to the details of this proposal.

In regard to the representations of the L.C.C. Schoolkeepers' Association for relief from the work of maintaining the present gas lights, the Committee consider that, if their proposals for the installation of modern burners—which require much less labour in changing and maintaining—are approved, the schoolkeepers as a body should be required to carry on for the present.

Kirkcudbright Gas Supply.—The position of the gas-works has been discussed by the Kirkcudbright Town Council, and a motion that a Committee be appointed, with authority to obtain expert advice, was defeated. Bailie Robb (the Convener) stated that, even at the present price of gas, the town did not compare unfavourably with others. The works were in a very different position from a year ago, as ten new retorts were in place, and other improvements had been made. Before lowering the price of gas, some of the debt must be paid off.

Town Councillors and a Sales Manager.—The Gas Committee recommended at last month's meeting of the Newbury Town Council the appointment of a Sales Manager for the undertaking at a salary of £250 per annum. Mr. Metcalf, who moved the adoption of the report, said if they were going to be a trading corporation at all, it was quite absurd to stop half-way. What was the good of a showroom without a showman? If they were not going to have a Sales Manager, let them shut-down the showroom. They now had a showroom not very well equipped, apparently uncared for, and with no selling staff whatever. Mr. Greet, in supporting the recommendation, said that the new man would initiate a selling policy, which at present was non-existent. If the members of the Council were owners of the gas undertaking, they would not hesitate in acting upon the advice the Committee had given. The Council, by eight votes to six, rejected the Committee's recommendation.

Centralization Scheme at Stoke-on-Trent.—The minutes of the Gas Committee presented to the Stoke-on-Trent Town Council last week contained a report that the Committee had inspected the Etruria Gas-Works, which had recently been purchased by the Corporation, and the Engineer (Mr. A. Mackay) had indicated his suggestions as to carrying out extensions, plans for which he proposed to bring before the Committee. Alderman F. Hayward said he had the greatest confidence in the ability of the Gas Engineer, but in a matter of this kind, where the expenditure of a million of money was concerned, they ought to have further advice before they entered upon the scheme. Mr. J. A. Dale urged that the Gas Committee ought to have the confidence of the Council in the matter, and that they should first formulate their plans. Alderman Hayward said it was not a matter of want of confidence in the Gas Committee. He moved that the Engineer prepare a scheme, that expert advice be obtained upon it, and that subsequently the scheme be submitted to the Gas Committee and the Council. Mr. Dale seconded; and after the Mayor had remarked that the centralization of gas manufacture at the Etruria works, and the linking-up with the four existing undertakings of the Corporation, was an extremely important matter, the resolution was adopted.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 8.

Tar products generally continue steady, and prices are fairly well maintained. Pitch is a strong market, but makers are not at all anxious sellers. The price is firm at round about 80s. per ton f.o.b. makers' works. Creosote is in short supply, and prices are advancing. The value to-day is from 6¼d. to 6⅜d. per gallon net, f.o.b. makers' works. Solvent naphtha is quiet at about 2s. 3d. to 2s. 4d. per gallon for 95-160 quality. Pure benzole and pure toluole are about 2s. 6d. per gallon.

Tar Products in the Provinces.

Aug. 8.

The average values for gas-works products during last week were: Gas-works coal tar, 43s. to 48s. Pitch, East Coast, 76s. to 78s. f.o.b. West Coast—Manchester, 70s. to 72s. 6d.; Liverpool, 71s. to 73s. 6d.; Clyde, 75s. to 77s. 6d. Benzole 90 p.ct. North, 2s. to 2s. 1d.; crude 65 p.ct. at 120° C., 1s. 1½d. to 1s. 3d. naked at makers' works; 50-90 p.ct., naked, North, 2s. to 2s. 1d. Toluole, naked, North, 2s. to 2s. 3d. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 2s. to 2s. 1d. Creosote, in bulk, North, liquid, 5⅝d. to 6d.; salty, 5⅜d. to 5⅝d. Scotland, 4¾d. to 5d. Heavy oils, in bulk, North, 6¼d. to 6½d. Carbolic acid, 60 p.ct., 2s. 1d. to 2s. 2d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

There is very little to report in this market beyond a continued strength in pitch, which in some districts is quoted at between 87s. 6d. and £5 per ton. There is still a very keen inquiry. There is not so much creosote on offer, and with a steady demand prices are well maintained as last quoted. The road tars are still in demand, and there are signs of a shortage in certain districts which will become more acute towards the end of the month. Carbolic acid is without change, apart from a small increased inquiry for crude 60's from the Continent. Cresylic acid is also without change. Intermediate products have continued to be inquired for to a small extent for home purposes; and the export market has become much more interesting.

Sulphate of Ammonia.

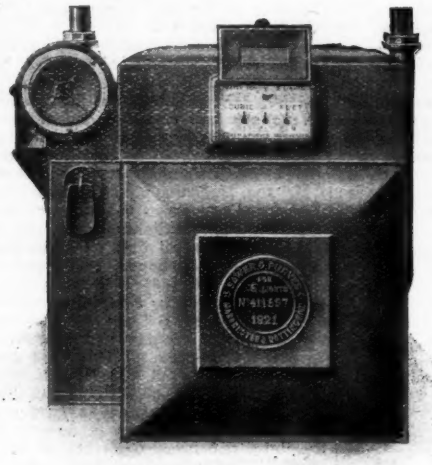
There is nothing fresh to report in this market. Values keep very firm at about £17 per ton for export for delivery before October. There has been a very good demand from the home trade for warehousing purposes for deliveries during the next month; and with production still on the small side, it is practically certain that the home demand will be able to absorb the bulk of the production from January onward.

An Unfortunate Contract.

At the London Bankruptcy Court, on the 1st inst., the public examination was concluded of William Stanley Edward Lowe, of No. 15, Morley Street, East Twickenham, and now or lately carrying on business as Douglas Thomas & Co., at No. 35, Craven Street, Strand. The Receiving Order was made on June 28, 1922, on the petition of a creditor; the act of bankruptcy being the failure of the debtor to comply with the requirements of a bankruptcy notice. The statement of affairs showed liabilities expected to rank amounting to £1639, and net assets estimated to produce £1 13s. In 1919, the debtor entered into a contract for the purchase of about 3000 gross of gas-mantles. Only about 20 gross were delivered, and in consequence he brought an action against the suppliers for breach of contract, but judgment was given against him. He attributed his insolvency to the result of the action and bad trade.

Gas-Works Acquisition in Lanarkshire.

At a general meeting of the County Council of Lanarkshire, the Finance Committee reported that a letter had been submitted from the Clerk to the Middle Ward District Committee, which stated that the District Committee had been in communication with the Baillieston Gas Company on the question of the Company extending their gas-mains to supply the County Council's new houses in the district under the housing scheme. The Company had intimated that, to give the required supply of gas to the new houses would entail extensions of, and additions to, their existing plant, and they had suggested that the County Council might consider the question of the possible purchase of the undertaking. The meeting remitted the matter to the Sub-Committee on the Acquisition of Gas Undertakings in the Middle Ward District to examine into the question and report, and the Council agreed. At a subsequent meeting of the Finance Committee, it was reported, on behalf of the Sub-Committee on the Acquisition of Gas Undertakings, that it had been found that the Baillieston gas undertaking was situated within the Glasgow gas area, and that the agent for the Company had agreed that, as matters stood, it would be *ultra vires* for the County Council to undertake the supply of gas in Baillieston. The Council adopted a recommendation of the Committee that no further action be taken in the matter. The Clerk reported the progress that had been made in connection with the proposed acquisition of the Holytown gas undertaking, and, after a discussion, the Finance Committee resolved to grant powers to the Sub-Committee to settle at an inclusive price of £10,000. This was homologated by the County Council.



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Chemical Works Regulations.

In pursuance of section 79 of the Factory and Workshop Act, 1901, a series of regulations for chemical works has been issued by the Home Office. Nothing in the regulations is to apply to the manufacture and necessary purification of coal gas, water gas, and producer gas for lighting, heating, and power purposes. Mainly the regulations (which are for securing greater safety in working) will take effect on Oct. 1 next; but certain of them which affect, among other industries, the "distillation of gas or coal tar or any process in chemical manufacture in which gas or coal tar is used," and "the manipulation of pitch," are not to come into force until April 1 next year. One of the regulations coming into force on the earlier date is to the effect that: "Before any person enters a gas-tar or coal-tar still for any purpose except that of rescue, it shall be completely isolated from adjoining tar stills, either by disconnecting the pipe leading from the swan-neck to the condenser worm, or the waste-gas pipe fixed to the worm-end or receiver; and, in addition, blank flanges shall be inserted between the disconnected parts, and the pitch discharge pipe or cock at the bottom of the still shall be disconnected." The regulations which will come into force next April have reference to the provision of ambulance rooms up to a specified standard, as well as cloak room and canteen accommodation, and efficient cleansing facilities.

Time Limit of Regulation Act Applications.—At a meeting of the Airdrie Town Council, the Town Clerk directed attention to the terms of the Gas Regulation Act, which provided for application being made before Aug. 4, 1922, to the Board of Trade for the repeal of any enactments or other provisions requiring suppliers to supply gas of any particular illuminating or calorific value, and for substituting power to charge per thermal unit supplied in the form of gas. In connection therewith, information was submitted from other corporations owning gas-works, which showed that meantime they were taking no action in the matter. The Committee agreed that the Town Clerk should communicate with the Board of Trade with a view to ascertaining whether any further period would be allowed for the lodging of the necessary application. The Town Council approved of this.

Loss on the Gas-Works at Conway.—The Town Clerk submitted to a meeting of the Conway Town Council last week a statement giving the result of the year's operations of the gas-works. Owing to the extraordinary increase in the cost of manufacture, the result showed a considerable deficiency. The total expenditure for the year ended March 31, apart from loan charges, amounted to £16,257, as compared with £13,751 in 1921, an increase of £2506, with a reduction in the revenue of £964. After providing for repayment of loans (amounting to £989) made during the year, and interest and other charges, the loss on the year's working was £4464, the whole of this being attributed to the extra amount paid for coal, coke, oil, &c., purchased at high prices during the coal strike, in order to keep the works going, and to the great drop in the selling prices of residuals. From an estimate of the cost of manufacture for the current year, it is anticipated that considerable reduction will be made in the expenditure, and that the result will be much more satisfactory. Mr. F. J. Jones said that the figures were somewhat staggering, in view of the quality and the price charged for gas; and he could not see any hope of relief from the excessive charges. He moved that the members be supplied with a detailed statement as to how the loss had been incurred, and this was agreed to.

Price of Gas in Liverpool and Birkenhead.—The "Liverpool Post" says: In comparison with London, it seems that Liverpool has reason for self-congratulation in regard to the price of gas. The last reduction in the price of Liverpool gas was announced about a fortnight ago, when for the September quarter the price was reduced 1d. per therm, bringing it down to 9d. a therm. The Liverpool Gas Company declare the heat value of their gas to be 475 B.Th.U. But if Liverpool's price compares so favourably with those of London, a comparison of prices must be a depressing business to Birkenhead consumers. Nowhere in London is the price of gas so high as in Birkenhead. The price in the Merseyside borough at present is 4s. 9d. per 1000 c.ft.; and while residents in other towns have enjoyed reductions, the last change in Birkenhead's price took place in December, 1921, and this was an increase of 6d. per 1000 c.ft. It is pointed out that until the rise in December, 1921, there had been no increase at Birkenhead since July, 1920, though a coal strike had intervened and most places had advanced the gas prices. The charges for gas in the Merseyside districts at present are as follow: Liverpool and Bootle 9d. per therm, or 3s. 6¾d. to 3s. 9d. per 1000 c.ft., Birkenhead 4s. 9d. per 1000 c.ft., Wallasey 3s. per 1000 c.ft., Hoylake and West Kirby 5s. 10d. per 1000 c.ft.

Coatbridge Gas Company.—In submitting the statement of accounts and balance-sheet for the year ended June 30 last, the Directors of the Coatbridge Gas Company inform the proprietors that they are satisfactory. The report, which is signed by the Chairman (Mr. A. S. Legat), goes on to say that the vertical retort installation was put to work on July 8, 1921, and the whole output of gas since that date has been successfully produced by it. The sale of gas for the past twelve months amounted to 1,093,013·6 therms, being a decrease of 46,588 therms compared with the corresponding period, the general state of trade having reflected adversely on the sales. From the results of six months' working to December last, the Board felt justified in reducing the gas rate as from Jan. 1 by 1 2d. per therm; and from the results of twelve months' working a further reduction of the same amount has bsen made as from July 1. The Order promoted early this year for additional capital powers and other purposes was made by the Board of Trade on June 13. The Directors recommend the payment of dividends in accordance with the sliding-scale, at the rate of £11 5s. p.ct. per annum on the original stock and of £7 17s. 6d. p.ct. per annum on the four issues of £10 shares (all less income-tax). The Directors regret that during the year they and the Company sustained a great loss through the death of Mr. Alexander Neilson, a shrewd and capable member of the Board. They also record with regret the passing of Mr. Thomas Wilson, the late Manager.

STOCK MARKET REPORT.

THE week just closed on the Stock Exchange was a very quiet affair, as might be expected at this season of the year, and the general tendency was dull and devoid of animation. While markets pretty well all round were giving way, the gilt-edged department managed to escape much damage. Consols and Funding were lower; but War Loan and Victory held on, Friday's figures being: Consols 58½-59⅛, War Loan 100⅜-100⅝, Funding 88⅝-89¼, Victory 90⅛ 90⅜. Bonds and Indians were dull. Home Rails met with little support, except in special lines. Canadians rallied a little; but Argentines were down.

The Foreign Market was weak, with falls in French, German, Russian, Brazilian, Peruvian, and Chinese. Rubber and Oil were down.

Business in the Gas Market was a good deal quieter in common with the rest, and Gas Light ordinary was the only issue showing any animation. The prevailing tone was satisfactory; but movements in prices were not so exclusively in the upward direction long prevailing. In the London Companies, Gas Light ordinary fell 2½, and South Metropolitan 1. In Suburban and Provincial, Bournemouth "B" rose 1½, ditto debenture 2, Portsea "B" 14, ditto "C" 7, and Tynemouth 3. Imperial Continental fell 2.

The following transactions in gas during the week were recorded: On Monday, Brentford "A" 96, British 33⅜, Gas Light ordinary 95, 96, 96¼, 96⅜, 96½, 96¼, 97, ditto maximum 63, ditto preference 78½, ditto debenture 63½, 63¾, Primitiva 16s. 6d., ditto preference 41s. 3d., South Metropolitan 96, 97, South Suburban 100½, 101, Tottenham "A" 120, 120½, ditto "B" 100, Danish 4 p.ct. debenture 52½. On Tuesday, Cape Town debenture 75, European 12⅜, Gas Light ordinary 93, 94, 94½, 94½, 95, 96, ditto maximum 62½, 63, ditto preference 77½, ditto 10 p.ct. bonds 180, Imperial Continental 155⅜, 156, 156½, Primitiva 16s. 3d., ditto preference 41s. 3d., South Metropolitan 96, 96½, Tottenham "B" 100, Wandsworth "C" 90, Brentford 7½ p.ct. debenture 103. On Wednesday, Bombay 4⅝, Brentford 4 p.ct. debenture 79, Brighton and Hove original 172, Commercial 4 p.ct. 96, ditto 3½ p.ct., 92½, Gas Light ordinary 93, 93½, 93¾, 94, 94½, 94½, ditto maximum 62½, 63½, ditto preference 78, 78½, 78½, ditto debenture 63, Hornsey 121½, 122, Imperial Continental 155, ditto debenture 74, Portsea "D" and "E" 75, 75½, Primitiva preference 41s. 3d., Wandsworth "B" 99, 99½, Brighton and Hove 5 p.ct. debenture 99, Liverpool 7 p.ct. preference 107, North Middlesex 5 p.ct. preference 60, Romford 7 p.ct. "B" 15/16. On Thursday, Bournemouth "B" 11½, European 12⅛, Gas Light ordinary 93½, 93⅝, 94, 94½, ditto maximum 63½, 63⅜, ditto preference 78½, Imperial Continental 154, Newcastle 82½, Primitiva 16s. 3d., ditto preference 41s. 3d., 42s. 6d., River Plate debenture 56⅜, 56⅞, South Metropolitan 95½, 96, 96½, ditto 6½ p.ct. debenture 106⅜, South Suburban 100½, Tottenham "A" *ex div.* 114½, 115, ditto "B" *ex div.* 100, Swansea 6½ p.ct. debenture 104½. On Friday, British 30⅞, 31½, Gas Light ordinary 93, 93½, 93⅜, 93⅝, 94, 94½, 94½, 94 16/16, ditto maximum 62½, 63, Imperial Continental 153, Primitiva 15s. 6d., ditto 1911 debenture 56, 56⅜, South Metropolitan 95⅝, ditto 6½ p.ct. debenture 106½, Croydon 4 p.ct. debenture 74, East Grinstead 7 p.ct. maximum "C" 8⅜, Swansea 7 p.ct. preference 103½, 103⅝, Tottenham 5 p.ct. preference 90.

In the Money Market, rates opened firm, and the pressure steadily increased until Thursday, when it culminated in a sharp demand. This, however, relaxed the next day. Discount terms hardened materially and closed without relief. Silver was steady at 35⅛d. The Bank of England rate was 3 p.ct., as fixed on the 13th ult.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
182,049	Stk.	Mch. 15	4	4%	Aldershot 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Apl. 12	2½	3⅛%	Alliance & Dublin Ord.	59—64	60—65	...
374,000	,,	July 13	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	May 18	7½	4/-	Bombay, Ltd.	5⅛—6⅛	4½—5	4⅛
100,000	5	Feb. 23	16	7½%	Bournemouth Gas and Water { 5 p.c. B 7 p.c.	..	11—12	...
383,110	10	,,	7	7%	Bournemouth Gas and Water { Pref. 6 p.c.	15—15⅛	10½—11½	11⅛
115,000	10	,,	6	6%	Bournemouth Gas and Water { 4 p.c. Deb.	13⅛—14	8—9	...
162,065	—	June 29	—	4%	Brentford A Consolid.	..	63—68	...
992,045	Stk.	July 27	14	6t/-	Do. B New	261—266	92—97*	96
734,920	,,	,,	11	6t/3	Do. 5 p.c. Pref.	204—209	92—97*	...
55,000	,,	,,	5	5%	Do. 4 p.c. Deb.	109—111	82—87*	...
221,400	,,	June 15	4	4%	Brighton & Hove Orig.	91—93	75—80	79
214,775	,,	Mch. 15	11	11%	Do. A Ord. Stk.	208—213	165—170	172
244,200	,,	,,	8	8½%	Bristol 5 p.c. max.	154—159	118—123	...
1,287,500	Stk.	July 28	5	5%	British	..	..	...
530,000	20	Mch. 15	12½	10%	Do. 4 p.c. Deb. Stk.	44—45	30—32	30⅞—31⅛
120,000	Stk.	June 29	4	4%	Buenos Aires 4 p.c. Deb.	88—90	76—80	...
245,771	,,	,,	4	4%	Cape Town & Dis., Ltd.	85—87	53—58	...
100,000	10	June 1	—	7%	Do. 4½ p.c. Pref.	1½—2½	6½—7½	...
100,000	10	Apl. 27	—	4½%	Do. 4½ p.c. Deb. Stk.	4—6	6—6½	...
100,000	Stk.	June 29	4½	4½%	Chester 5 p.c. Ord.	70—75	73—78	75
100,000	Stk.	Feb. 26	5	5%	Commercial 4 p.c. Stk.	108—110	..	...
157,150	,,	July 27	5/9/4	56/-	Do. 3½ p.c. do.	106—108	92—97*	96
1,513,280	,,	,,	5½	55/-	Do. 3 p.c. Deb. Stk.	103—105	92—97*	92½
560,000	,,	June 15	3	3%	Continental Union, Ltd.	69½—71½	55—60	...
475,000	,,	Dec. 15	4	—	Do. 7 p.c. Pref.	76—79	37—42	...
800,000	,,	,,	7	—	Croydon A 10 p.c.	115—118	55—60	...
200,000	,,	Feb. 23	15	15%	Croydon B and C 7 p.c.	..	200—210	...
51,600	,,	,,	12	12%	Derby Con. Stk.	..	160—170	...
278,400	—	,,	6	4½%	Do. Deb. Stk.	123—125	80	...
492,270	Stk.	—	4	4%	European, Ltd.	102—104	65	...
55,000	,,	—	4	5/0	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds	17⅛—18	12—13	12½
1,802,180	10	July 13	10	52/-		98—102	93—96*	93—97
16,298,973	Stk.	July 27	4/17/4	35/-		76—79	61—64*	62½—63½
2,609,000	,,	,,	3½	3½%		96—99	76—80*	77½—78½
4,062,235	,,	,,	4	4%		72½—74½	62—65	63—63½
4,674,850	,,	June 15	3	3%		..	..	180
130,000	,,	Dec. 11	10	10%	Hastings & St. L. 5 p.c.	..	78—81	...
82,500	,,	Sept. 14	5	3½%	Do. 3½ p.c.	87—89	60—63	...
258,740	,,	Mch. 15	3½	2½%	Hongkong & China, Ltd.	16½—16⅝	6—7	...
70,000	10	May 18	11	5%	Hornsey 7 p.c.	..	115—120	121½—122
86,600	Stk.	Mch. 15	9	9%	Ilford A and C	151—154	120—130	...
131,000	,,	,,	7½	7½%	Do. B.	115—118	110—115	...
65,780	,,	,,	6½	5½%	Do. 4 p.c. Deb.	92—94	73—78	...
65,500	,,	June 29	4	4%	Imperial Continental	150—160	153—158	153—156½
1,976,000	,,	May 18	9	5%	Do. 3½ p.c. Deb. Red.	84—86	74—79	74
404,800	,,	Feb. 9	3½	3½%	Lea Bridge Ord. 5 p.c.	119—121	93—98*	...
235,242	,,	July 27	6½	6½%	Liverpool 5 p.c. Ord. { A. B.	211—213	..	...
2,498,905	,,	Feb. 26	10	37/6		146—148	..	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	...
165,736	,,	Feb. 23	7/5/6	6%	Maidstone 5 p.c.	..	87—92	...
63,480	,,	June 29	—	3%	Do. 3 p.c. Deb	..	54—59	...
75,000	5	,,	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4⅝	3½—3⅝	...
250,000	100	Apl. 3	4½	4½%		99—101	91—98	...
541,920	Stk.	June 1	4	4%	Monte Video, Ltd.	11½—12	63—68	...
1,875,892	,,	July 27	4½	4½%	Newcastle & Gatsh'dCon.	98½—99½	82—83*	82½
529,705	,,	June 29	3½	3½%	Do. 3½ p.c. Deb.	82—83	68—70	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	12½—13	...
55,940	10	Mch. 15	7/14/0	10/12	,, ,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	May 18	8	8%	Oriental, Ltd.	117—122	92—97	...
60,000	5	,,	10	—	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	June 29	—	6/3/9%	Plym'th & Stonh'se 5 p.c.	..	93—98	...
60,000	50	Mch. 15	13	62/6	Portsea Island, B	128—131	100—105	...
100,000	50	,,	12	57/6	Do. C	118—121	85—90	...
249,980	5	,,	8	—	Primitiva Ord.	5½—6	⅞—1	15/6—16/6
499,960	5	—	5	—	Do. 5 p.c. Pref.	4½—5	2—2½	4/3—4/6
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	74—76	...
600,000	Stk.	July 27	4	4%	Do. ,, ,, 1911	..	55—60*	56—56½
346,198	,,	June 29	4	4%	River Plate 4 p.c. Deb.	85—87	53—58	56½—56⅝
150,000	10	Mch. 30	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	5½—6½	...
125,000	50	July 3	5	5%		47—49	35—38	...
135,000	Stk.	Mch. 15	10	5%	Sheffield A	223—224	94½—96½	...
209,984	,,	,,	10	5%	Do. B	222—224	94½—96½	...
523,500	Stk.	Sept. 15	4	4%	Do. C	220—222	94½—96½	...
133,201	10	June 29	9	7½%	Shrewsbury 5 p.c.	..	..	...
90,000	Stk.	July 27	5/4/0	5%	South African	10½—11⅛	7—9	...
6,609,895	,,	July 13	—	3%	South Met. Ord.	111—113	95—97*	95½—97
250,000	,,	,,	3	3%	Do. Red. Pref.	..	94—96	...
1,895,445	,,	Feb. 23	8½	8½%	Do. 3 p.c. Deb.	72½—74½	61—64	...
224,820	,,	,,	6	5½%	South Shields Con. Stk.	157—159	109—111	...
1,087,795	,,	June 15	5	5%	S'th Suburb'n Ord. 5 p.c.	114—116	98—103	100½—101
368,837	,,	May 18	5	5%	Do. 5 p.c. Deb. Stk.	116—118	93—98	...
647,740	,,	June 29	4	4%	Southampton Ord.	99—102	70—75	...
121,275	,,	July 27	—	7½%	Do. 4 p.c. Deb. Stk.	..	63—68	...
120,000	,,	,,	6	6%	Tottenham { A 5 p.c. B 3½ p.c.	135—138	110—115*	114½*—120½
782,275	,,	June 15	4	4%	District { 4 p.c. Deb.	115—117	97—102*	100*
181,255	,,	Dec. 30	5	—	Tuscan, Ltd.	87—89	75—80	76
182,380	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	5—6	1—2	...
149,900	10	Mch. 15	5	3½%	Tynemouth 5 p.c. max.	93—95	45—50	...
236,476	Stk.	,,	,,	,,	Wandsworth, Wimbledon, and Epsom—	108½—109	74—76	...
30,000	,,	July 27	8½	72/6	Wandsworth A 5 p.c.	151—156	111—115*	...
255,636	,,	,,	6½	57/6	Do. B 3½ p.c.	129—134	95—100*	99—99½
128,075	,,	,,	—	50/9	Do. C.	..	85—90*	90
140,865	,,	,,	—	50/9	New Ordinary	..	85—90*	...
332,000	,,	,,	6½	53/9	Wimbledon 5 p.c.	117—122	92—97*	...
98,000	,,	,,	6½	58/9	Epsom 5 p.c.	121—126	95—100*	...
88,416	,,	June 29	3	3%	3 p.c Deb. Stk.	66—69	57—60	...

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Big Gas Price Reduction at Perth.—A reduction of 1s. 2d. per 1000 c.ft. is to take place in the price of gas at Perth. The gas department draft estimates for the current year, which have just been issued, show that, though there has been a £7000 decrease during the past year in the revenue derived from residuals, the fall in the price of coal and wages compensated for this reduction. The estimates show further economies, especially in coal, in which there will be a considerable saving during the last six months of the financial year, when the new vertical retorts are operating. This permits of the gas being reduced from 5s. 8d. to 4s. 6d. per 1000 c.ft.

Damage to the Airdrie Gas-Works.—An extraordinary accident was reported to the Town Council of Airdrie as having occurred at their gas-works recently. It appeared that a wagon containing a tank of oil was shunted on to the loop of the siding, and, not being properly braked, was later struck by a number of wagons which were being shunted on to the main line of the siding. The result was that the wagon containing the oil tank was knocked off the loop through the retaining wall of the siding, falling a distance of from 15 to 20 ft., where it struck and wrecked a large gasholder. The damage had been at once reported to the local agent of the Railway Company, who, along with a number of other railway officials, had visited the works and obtained full details of the damage. The Gas Committee had instructed the Town Clerk to write the Secretary of the North British Railway Company intimating the intention of the Council to hold the Company responsible for the entire damage which had been done. The Council approved of the Committee's action, and it was reported that negotiations were already in progress with the Railway Company to settle the matter.

A Short Strike at Burnley.—For a short time Burnley was without gas, as the men struck work on Saturday. Owing to it being Bank Holiday, six men were to be off work on Monday, and, contrary to the orders of the men's Secretary, all the rest struck work. The Secretary had gone on holidays, and could not be reached at once. The matter was, however, soon settled, and a full supply again was expected yesterday.

Baillieston Gas-Works Ownership.—The Glasgow Corporation Gas Committee have appointed a Special Sub-Committee to inquire as to the purchase of the Baillieston gas undertaking, which is at present owned by a private Company, who operate on the outer fringe of the Glasgow supply area. The district supplied by the Company includes the area between Baillieston and Coatbridge, and to the boundaries of Uddingston. At present consumers are charged 5s. 7d. per 1000 c.ft., as against 4s. 7d. charged by the Glasgow Corporation in a similar district.

As bearing upon the subject of fuel economy, it may be mentioned that during June Messrs. Meldrum's, Ltd., of Timperley, near Manchester, received orders for no less than seventeen forced draught furnaces, this number including installations at two gas-works. Orders for five destructors and some stokers were also booked.

Two men were killed recently at the chemical works at Hunslet, Leeds, of Messrs. Brotherton & Co., through an explosion in an ammonia plant. The rescue party worked under great difficulties, but eventually the bodies of the men were recovered from under the *débris*. A small piece of the wrecked tank made a hole, which had to be plugged, in a Corporation gasholder near by.

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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
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CORRESPONDENCE TUITION in GAS ENGINEERING for City and Guilds Institute Exams. (Preliminary and Final). Successful Results. Low Fees.
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COMBINED, AND SELF CONTAINED WATER AND COAL GAS PLANT.

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SPENCER'S Patent Inclined HURDLE GRIDS.

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Telephone: 596. Telegrams: "GASMETER," and at 268, Stockport Road, MANCHESTER.
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WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualifications being equal, has the FIRST CALL ON YOUR CONSIDERATION.

SKIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

APPLICATIONS are invited for the POST of WORKING FOREMAN in the Retort-House of the Council's Gas-Works. Applicants must have a thorough knowledge of the De Brouwer Stoking Machinery and also Water-Gas Plants.
Written Applications, giving Full Particulars of Abilities, Wages required, and accompanied by *copies* of not more than Two recent Testimonials, and endorsed "Foreman," to be sent to Mr. J. H. Woodward, Manager, Gas-Works, Skipton, not later than Monday, Aug. 28, 1922.
RICHARD WILSON, Clerk to the Council.

WANTED, for a Colonial Gas-Works, an ASSISTANT to the British Chief Clerk and Accountant. Five Years' Agreement, Free Passage out and Home and Residence in Company's Bungalow. Salary, £320 per Annum, Bonus paid on Working Results.
Apply, in own Hand Writing, to No. 7187, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

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FIRTH BLAKELEY, SONS, & CO., Ltd., Church Fenton, Leeds, have the following Plant to offer:
BEDS of 6's and 8's 22 by 15 ○ 6 in. Pipes. Cheap before removal. Could refix or Tender including Retorts and Settings.
GASHOLDERS—300,000, 172,000, 50,000, 40,000, and Two 5000 capacity.
"HOLMES," "KIRKHAM" & "CLAPHAMS" WASHER-SCRUBBERS, 10 in., 12 in., and 14 in. Connections.
"LIVESEY" WASHERS, 12 in. & 8 in. Connections.
CONDENSERS. Sets of 4 Annular, 8 in. & 12 in. Connections. Sets of 6 in. & 9 in. Vertical Pipes. Water Tube Condenser 15 in. Connections.
EXHAUSTERS and ENGINES. Waller's & Donkin's from 50,000 to 2000 capacity per hour, Steam, Gas, and Belt driven.
TOWER SCRUBBERS, 5 ft. by 40 ft., 4 ft. 6 in. by 36 ft., 4 ft. by 20 ft., 3 ft. by 13 ft.
PURIFIERS. Sets of 6 ft., 8 ft., 10 ft., 12 ft., and 25 ft. square.
STATION METERS and GOVERNORS. 40,000 to 2000 per hour, overhauled.
Every Requisite for Gas-Works supplied. We undertake Delivery and Erection Complete, and solicit inquiries.
DISMANTLING SPECIALISTS. Surplus and obsolete Plant purchased. Best prices paid. Removal by expert staff.
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RAILWAY Tank Wagons for Disposal, Rectangular and Cylindrical, specially suitable for Oil, Inflammable Liquids, also Acids. Inquiries invited.
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FOR SALE—Four Second-Hand Puri- FIERS, 25 ft. square, Equal to New. Cheap for Quick Sale.
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Apply at once to GOUGH AND WRIGHT, Chartered Accountants, CASTLE STREET, DUDLEY, WORCESTERSHIRE.

STATION Meter, about 50,000 c.ft. Capacity. Condition equal to new, 14 in. Connections, Cheap.
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CONTRACTS OPEN.

MANCHESTER CORPORATION.
(GAS DEPARTMENT.)

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corpora- tion of Manchester are prepared to receive TENDERS for the Supply of about 4000 to 5000 Tons of OIL for the Manufacture of Carburetted Water Gas, for Delivery before Sept. 30, 1922.
Conditions of Contract and further Particulars may be obtained on Application (in writing only) to Mr. Godfrey W. Kaye, Secretary of the Gas Department.
Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be Delivered at the Gas Offices, Town Hall, Manchester, not later than 10 a.m. on Thursday, the 17th of August, 1922.
The Corporation do not bind themselves to accept the lowest or any Tender.
By Order,
P. M. HEATH, Town Clerk.
Town Hall, Manchester, August, 1922.

SKIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS are invited for the Supply and Delivery to the Council of about 8000 Tons of Best Screened GAS COAL and NUTS, for a period of Ten Months from the 1st of September, 1922.
Forms of Tenders may be obtained on Application to Mr. J. H. Woodward, Manager, Gas-Works, Skipton, and sealed Tenders, endorsed "Coal," must be sent to him not later than Monday, Aug. 28, 1922.
The lowest or any Tender not necessarily accepted.
RICHARD WILSON, Clerk to the Council.

COMPANY NOTICES.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Offices of the Company, No. 139, Cannon Street, London, E.C., on Monday, the 28th day of August, 1922, at Half-past Twelve o'clock precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th of June last; to declare a Dividend; and to transact the General Business of the Company.
The TRANSFER BOOKS WILL BE CLOSED from the 15th to the 28th of August, both inclusive.
By order of the Board,
E. D. DAVEY, Secretary.
Offices:
139, Cannon Street,
London, E.C. 4,
July 28, 1922.

TROTTER, HAINES, & CORBETT, LIMITED
BRETTEL'S ESTATE,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST FURNACE BRICKS, LUMPS, TILES, and every Description of FIRE BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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CARBURINE & BENZOL FOR GAS ENRICHING
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Telephones: Museum 7400, 7401, 7402, 7403, 7404.
Telegraphic Address: "Carburine, London."

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WITH CORRUGATED SECTIONS.

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One	30	0 × 9	3 × 150	5764.
Eleven	30	0 × 9	3 × 160	5749/53 & 5924/9.
Three	30	0 × 9	3 × 120	6019/20 & 6027.
Three	30	0 × 8	6 × 120	6017/8 & 6026.
One	30	0 × 8	3 × 175	5984.
Two	30	0 × 8	3 × 160	6028/9.
One	30	0 × 8	3 × 120	6025.
Four	30	0 × 8	3 × 100	5678.
One	30	0 × 7	6 × 180	5967.
Three	28	0 × 7	6 × 160	5792/4.

All the above Boilers are built from "Siemens Martin" Acid Steel.
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